tober 1948

Chemical Industries

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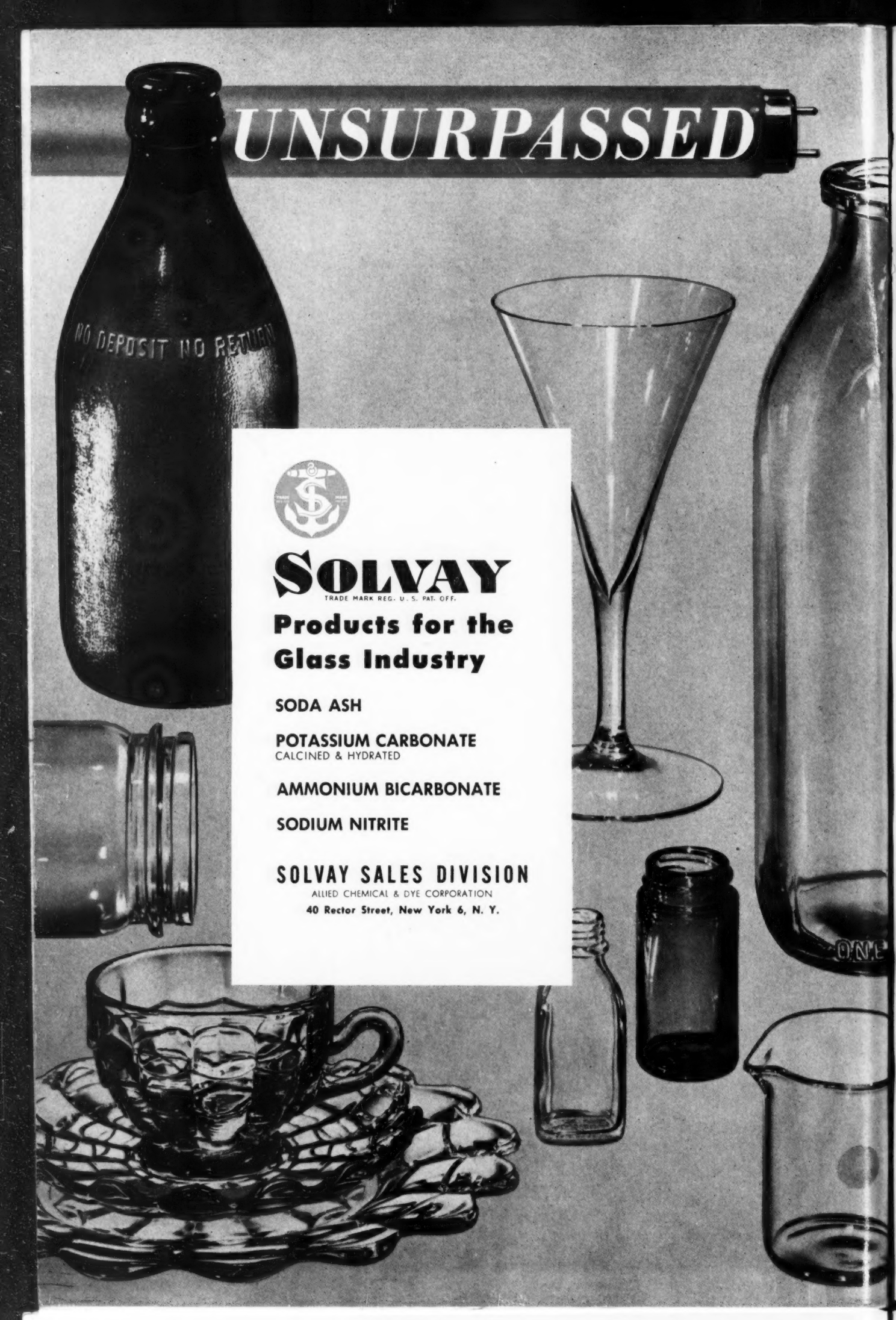
CATALYTIC DEVELOPMENTS INFLUENCE CHEMICAL PROCESSES p. 594

Cover: Catalytic cracking unit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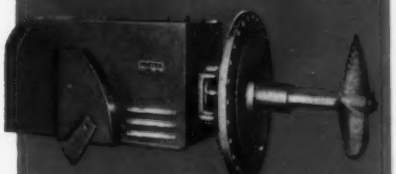
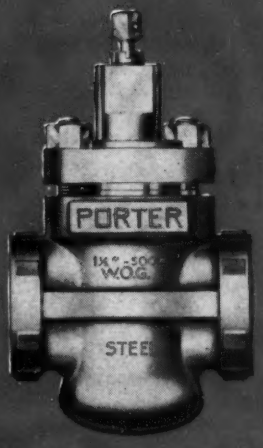
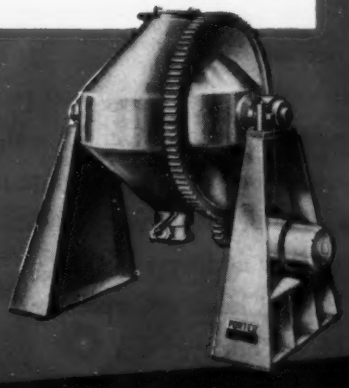


PORTER Liquid Mixers—Side Entering, Top Entering, Portable

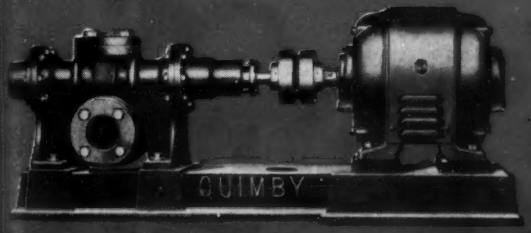


PORTER Lubricated Plug Valve

PORTER Double-Ribbon Mixers for Heavy Duty Operations



PORTER Double-Cone Blender for Rapid Blending of Powders, Crystals, Etc.



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Chemical Industries

"SERVING THE CHEMICAL PROCESS INDUSTRIES"

VOLUME 63—NUMBER 4 OCTOBER, 1948

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Chemical Industries is indexed regularly by Engineering Index, Inc. and Industrial Arts Index.

Cover: Standard Oil Co. (N. J.)

PUBLICATION STAFF: Editor, Robert L. Taylor; Managing Editor, Howard C. E. Johnson; Associate Editor, Herman W. Zabel; Assistant Editor, John J. Craig; Editorial Assistant, Barbara M. Bissell; Contributing Editors, T. Pat Callahan, T. N. Sandifer; Production Manager, Olga E. Vaream. **CONSULTING EDITORS:** Robert T. Baldwin, Lawrence W. Bass, Benjamin T. Brooks, J. V. N. Dorr, Charles R. Downs, Ernest W. Reid, Norman A. Shepard. **BUSINESS STAFF:** Business Manager, W. Alec Jordan; New York, L. C. Todaro, Wm. B. Hannum, Jr., Richard F. Burkhart; Chicago, Frank C. Mahnke, Jr.; Los Angeles, Don Harway; Circulation Manager, Florence Sanders.

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THE READER WRITES

World Commerce-Cassella Dye Program

To the Editor of Chemical Industries:

I was very much interested in the write-up on the World Commerce-Cassella dye program which appeared on page 212 of the August issue of your magazine.

I want to take this opportunity to congratulate you on this piece of journalism, as I think it is exceptionally well written and very interesting.

ROBERT PRODDOW, JR.
World Commerce Corp.
New York, N. Y.

Wants Permanent Treatment For Flameproofing Paper

To the Editor of Chemical Industries:

We have need for a chemical compound for treating paper to make it permanently flameproof. We have tried materials on the market but have not found one that is satisfactory. We have studied recent issues of your magazine but have found nothing on this subject.

The paper to be treated is a saturating kraft, and the tests are the standard TAPPI tests for flameproofing, which must be conducted in two ways, i. e. after the paper has been treated with the compound and dried, then after it has been soaked in water for 12 hours and dried.

You would greatly favor us if you could put us in touch with any firm who produces such a material.

O. F. HAMILTON, President
Hamilton Paper Corporation
Richmond, Virginia

Miller Mix-Up

To the Editor of Chemical Industries:

I have enjoyed reading the comprehensive articles by Dr. R. H. Wellman in the June and August issues of Chemical Industries on "Chemicals for Agriculture."

We note in the August copy, page 226-227, he lists Vitatone as a Miller product but gives the address of Miller Chemical and Fertilizer Corporation, Baltimore. We merely wish to advise that Vitatone, alpha naphthaleneacetic salt, is a product of Miller Products Company, Portland, Oregon.

I hope to have the pleasure of reading more of Dr. Wellman's comprehensive articles.

ROY E. MILLER, President
Miller Products Company
Portland, Oregon

"Hot Plants"

To the Editor of Chemical Industries:

In your July issue of your magazine, on Page 33, you published a news item entitled "Hot Plants."

The writer is very interested in this subject and would greatly appreciate your advising to what U. S. Departments I can write to get more specific information about the "isotope studies" being conducted by the U. S. Department of Agriculture Laboratories in cooperation with the various State Extension Divisions.

Your kindness in referring me to any pertinent data I may send for on this subject will be greatly appreciated.

ALLEN WHITE
San Francisco, California

Other readers interested in further information on the use of radioactive isotopes for studying fertilizer application are referred to the Bureau of Plant Industry, Soils, and Agricultural Engineering; U. S. Dept. of Agriculture, Agricultural Research Center, Beltsville, Maryland.—ED.

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Who Publishes Paint Dictionary?

To the Editor of Chemical Industries:

In Chemical Industries for June, 1948, in the first column of Page 998, mention is made regarding the "National Paint Dictionary," by Jeffrey R. Stewart.

Will appreciate it very much if you can inform us through what source this dictionary may be obtained.

ROSS L. HARBAUGH, Chief Chemist
Inland Steel Company
East Chicago, Indiana

The National Paint Dictionary is published by the Stewart Research Laboratory, P. O. Box 173-B, Washington, D. C.—ED.

Alkane Sulfonic Acids in Research Production Only

To the Editor of Chemical Industries:

I should like to draw your attention to an error on page 204 of your August issue. You state "Ethane- and methane sulfonic acids, produced on pilot-plant scale by Standard Oil Co. (Indiana) for some time, are now available in commercial quantities..." These two products are available only in research quantities, and it is "mixed alkanesulfonic acid" with which we are proceeding on a commercial scale.

WM. B. PLUMMER, Manager
Standard Oil Co. (Indiana)
Chicago, Illinois

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THREE ROADS TO CORROSION CONTROL

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Mutual chromates are used extensively as corrosion inhibitors. In most instances surprisingly small amounts are required to prolong indefinitely the life of the exposed metal. These applications include: recirculating spray systems for air washing and conditioning, cooling systems for internal combustion engines, refinery condensers and heat exchangers, oil well drilling muds, slushing compounds and water-soluble cutting oils, gasoline pipe lines, refrigerating brines and sealed-in absorbents for unit refrigerators.

If these uses suggest a possible application for chromates in your operations, our Research Department will be glad to collaborate with you.

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Potassium Bichromate
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Potassium Chromate
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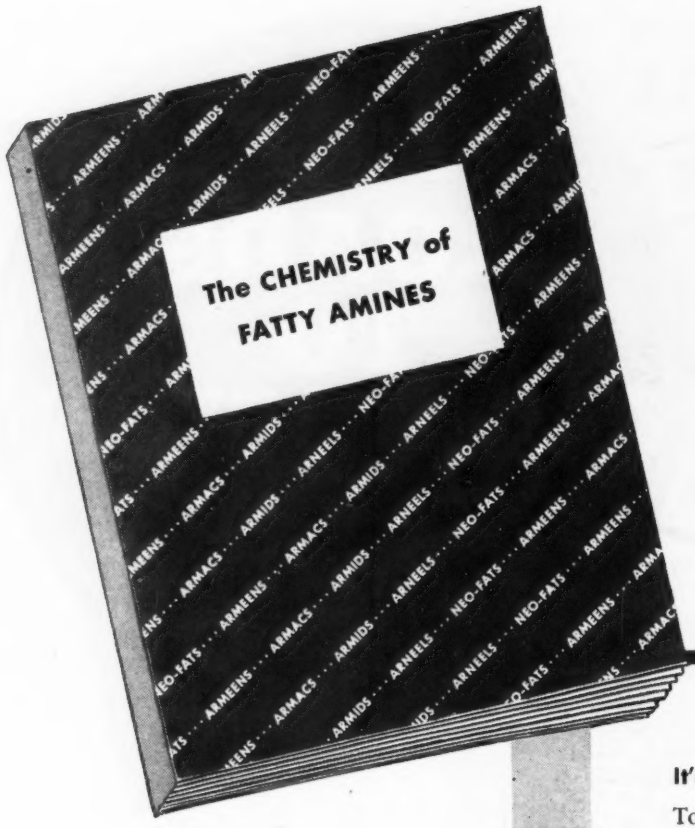

recommended reading for research chemists

Table of Contents includes:

Types of Fatty Amines . . . Synthesis of Fatty Amines . . . Saturated Fatty Amines . . . Unsaturated Fatty Amines . . . Vapor Pressure of Fatty Amines . . . Solubility of Fatty Amines . . . Handling The Fatty Amines . . . Quaternary Ammonium Salts . . . Chemical Reactions of Fatty Amines . . .

Coordination Reactions of the Fatty Amines (Hydration, with Mineral Acids, with Organic Acids, Formation of Metal-Ammino Complex Ions, Coordination of Alkyl Groups by Tertiary Amines, Tertiary Amine Oxides)

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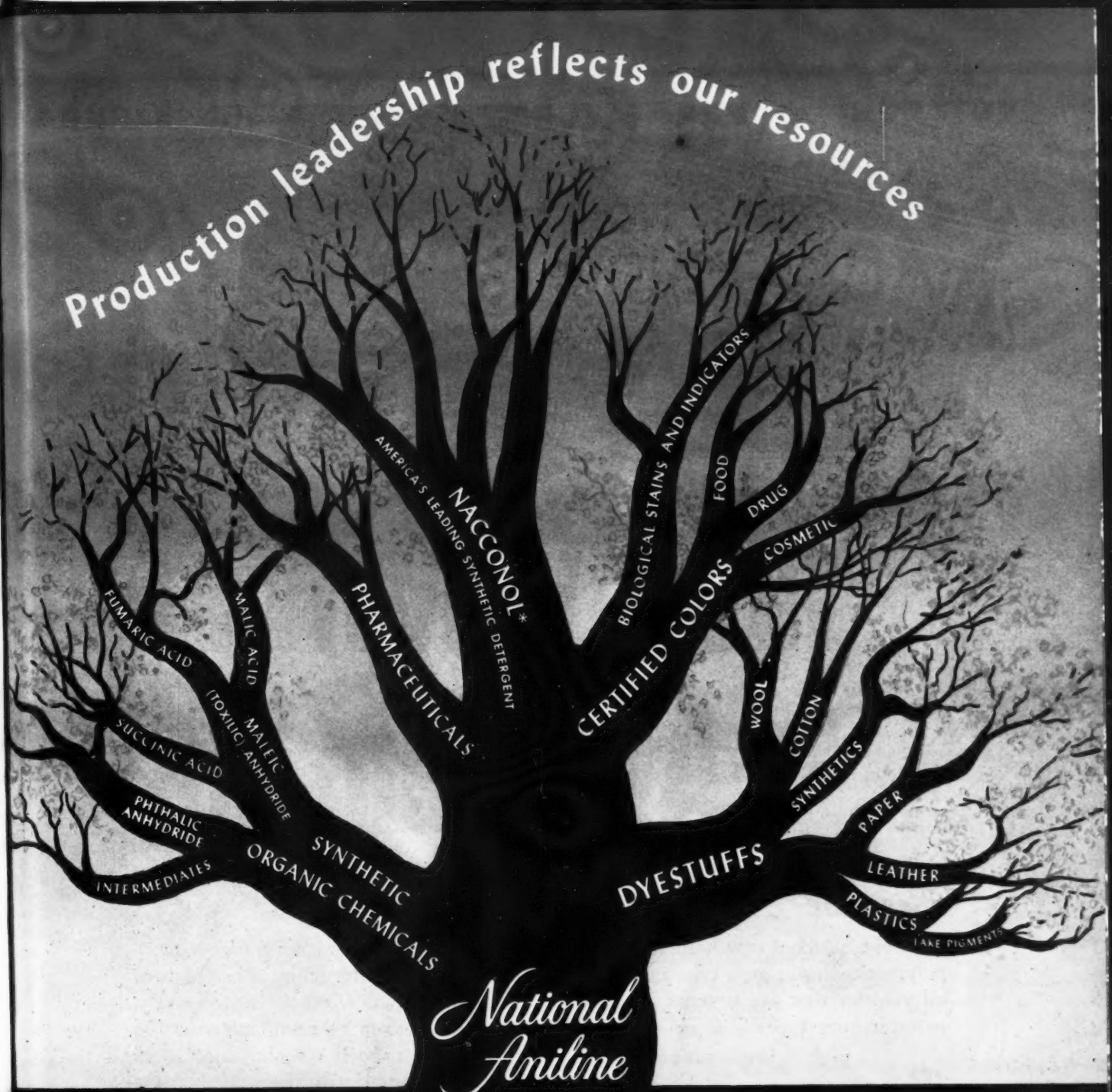

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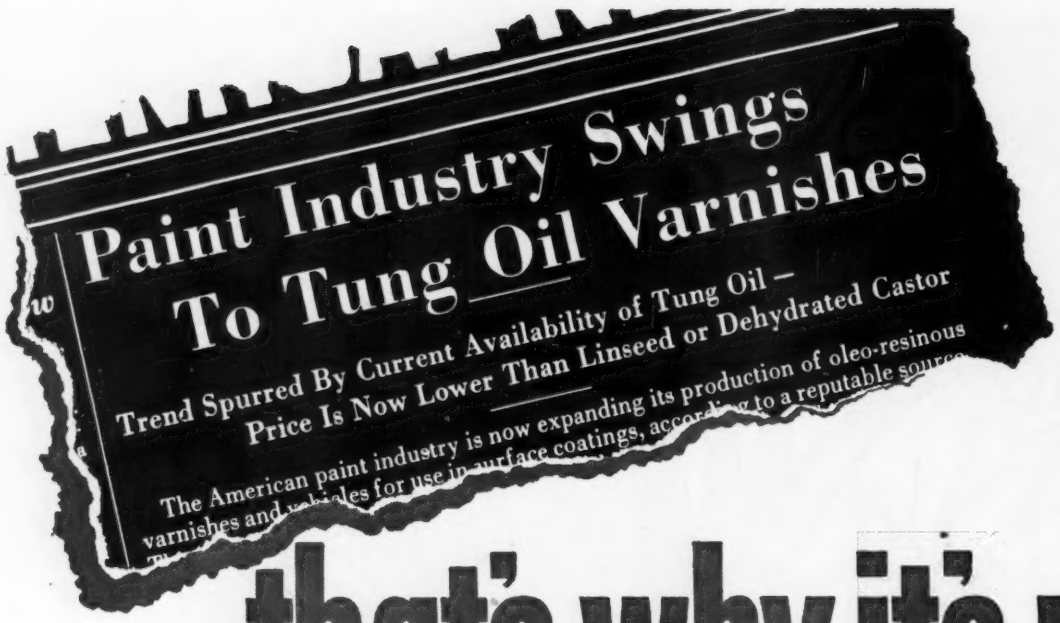
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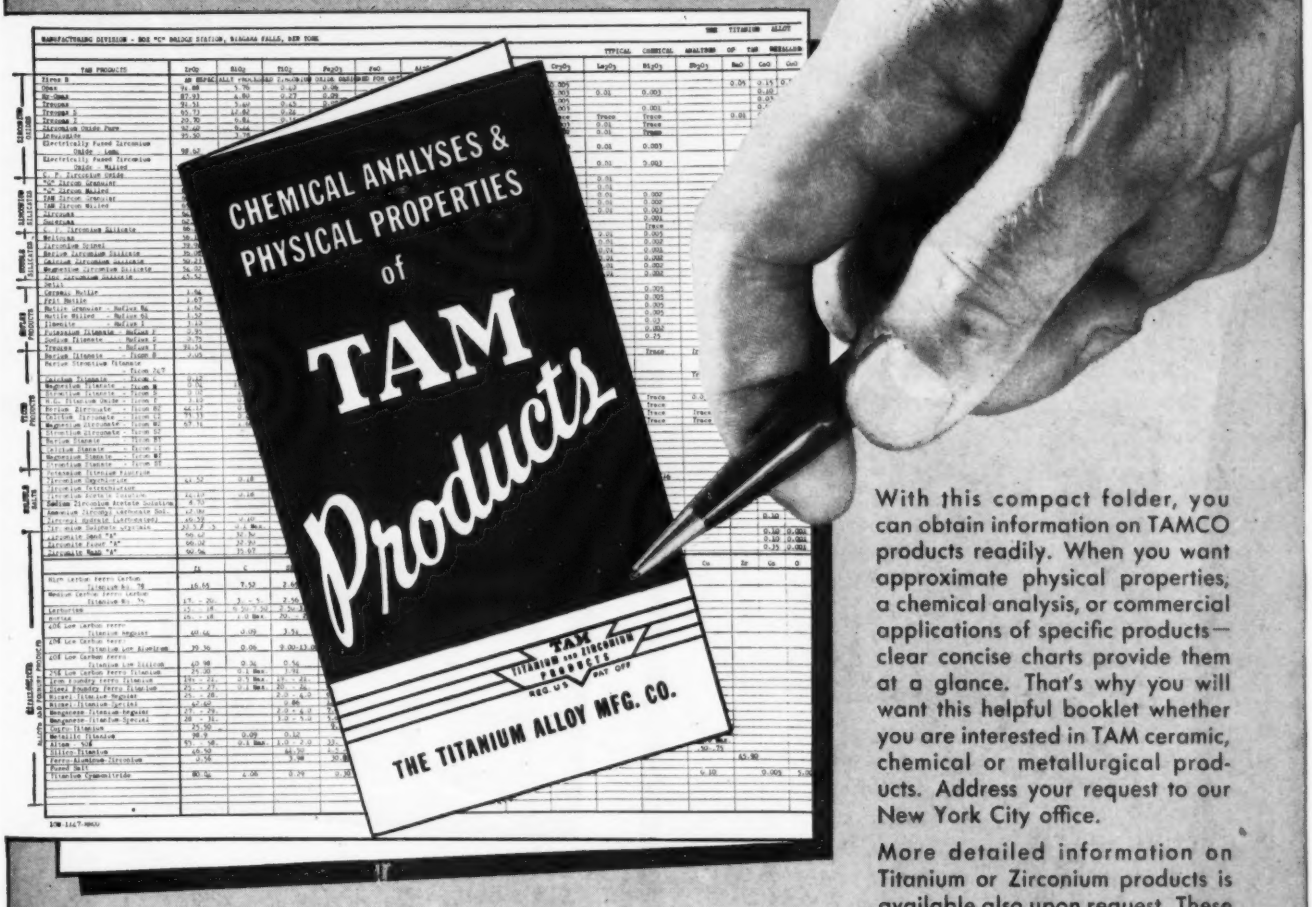
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Type Designation	Viscosity Range	Per cent sodium carboxymethylcellulose (dry weight basis)
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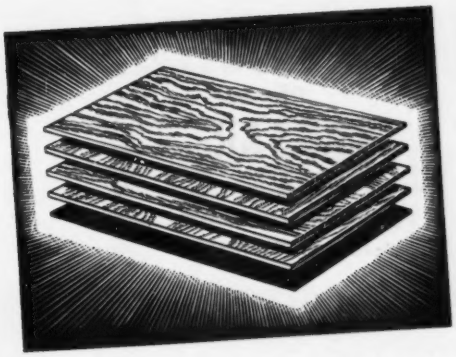
CMC-70 Medium Viscosity	300 to 600 cps. (2%)	99.5 +
CMC-70 High Viscosity	1300 to 2200 cps. (1%)	99.5 +

Pine Oils Improve Adhesives



Among the many products now being improved by the addition of Hercules Pine Oils are plywood adhesives. Here the Pine Oils act as anti-foaming and wetting agents, and protein preservatives. Hercules Pine Oils also serve in this capacity for many other types of adhesives, such as those made from casein and starch, and for animal and fish glues. Send for technical information and testing samples.

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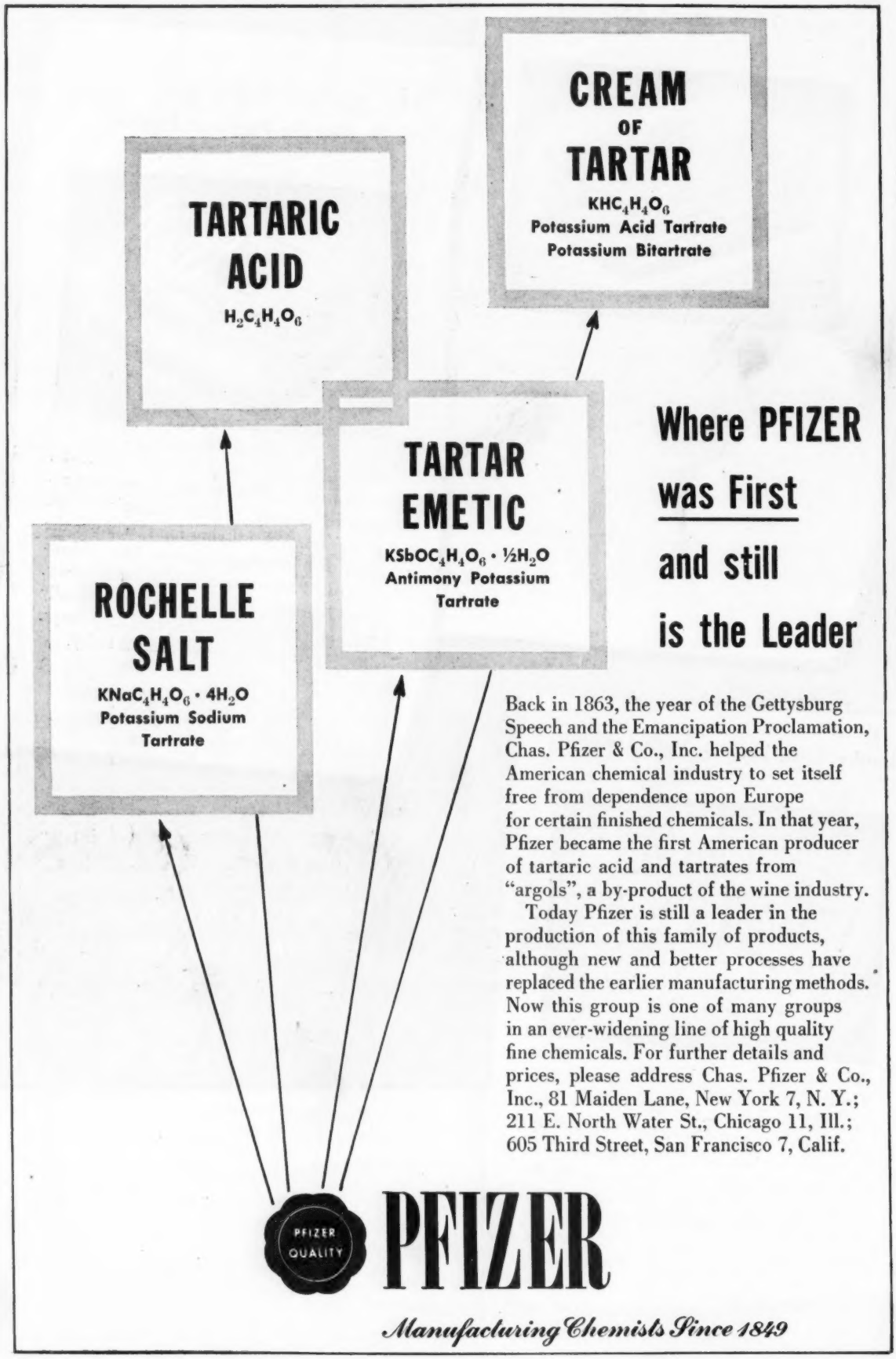
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and still
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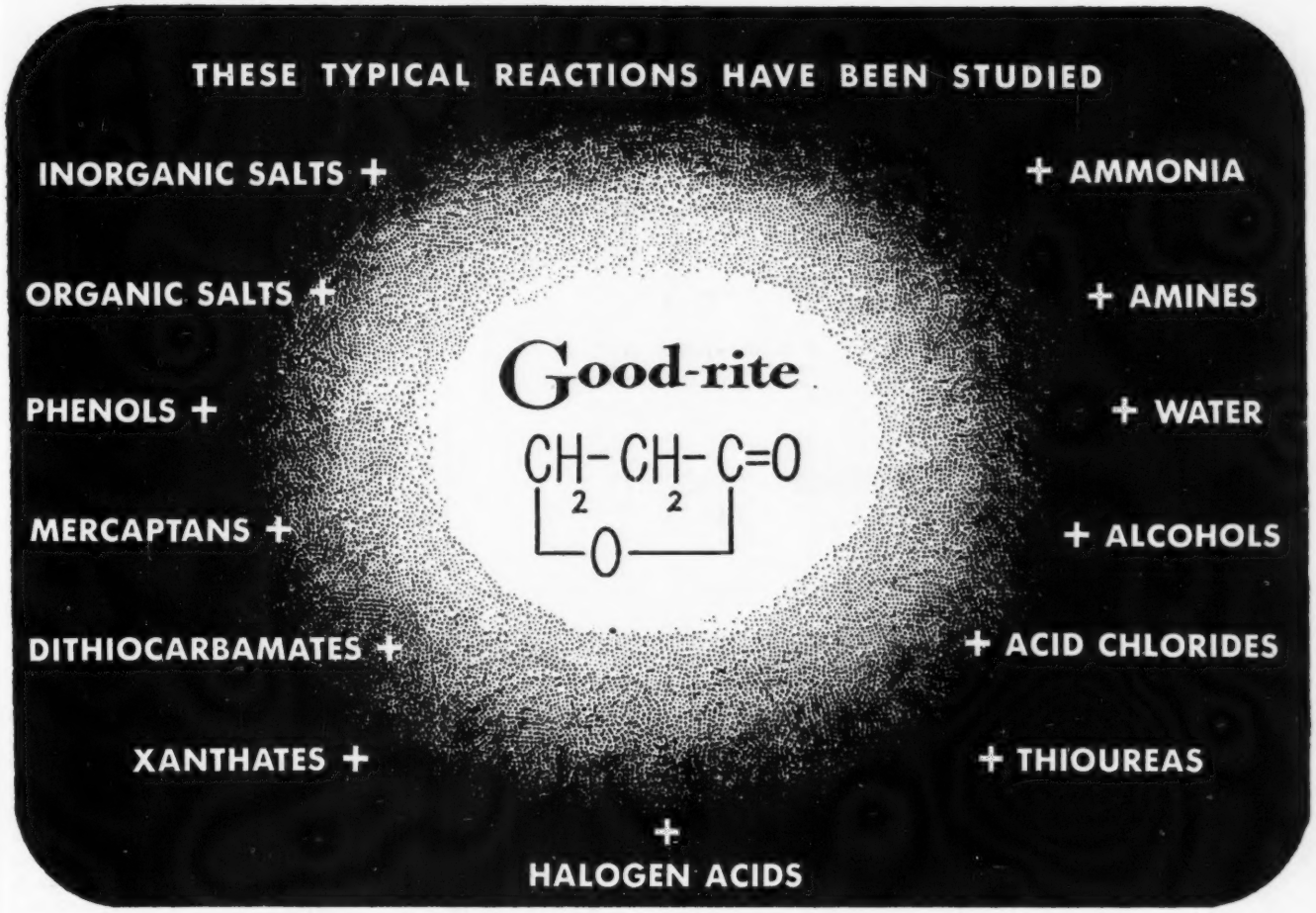
Back in 1863, the year of the Gettysburg Speech and the Emancipation Proclamation, Chas. Pfizer & Co., Inc. helped the American chemical industry to set itself free from dependence upon Europe for certain finished chemicals. In that year, Pfizer became the first American producer of tartaric acid and tartrates from "argols", a by-product of the wine industry.
Today Pfizer is still a leader in the production of this family of products, although new and better processes have replaced the earlier manufacturing methods. Now this group is one of many groups in an ever-widening line of high quality fine chemicals. For further details and prices, please address Chas. Pfizer & Co., Inc., 81 Maiden Lane, New York 7, N. Y.; 211 E. North Water St., Chicago 11, Ill.; 605 Third Street, San Francisco 7, Calif.
PFIZER QUALITY
PFIZER
Manufacturing Chemists Since 1849

Now...Beta-Propiolactone

BEGINNING A NEW CHAPTER IN ORGANIC CHEMISTRY



HOW many other types of organic chemicals will react with Good-rite beta-propiolactone have not been determined! But its versatility as a basic chemical intermediate has now been firmly established. It has unusual chemical activity—it even reacts with sodium chloride. It makes commercially possible an ever-increasing number of organic chemicals never before practical. At the same time beta-propiolactone offers improved methods for commercial production of many industrial chemicals—in a variety of fields. A bulletin describing the properties of Good-rite beta-propiolactone may be obtained by writing to Dept. CE-10, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

B. F. Goodrich Chemical Company A DIVISION OF THE B. F. GOODRICH COMPANY

GEON polyvinyl materials • HYCAR American rubber • KRISTON thermosetting resins • GOOD-RITE chemicals

FOR YOUR INFORMATION

DERIVATIVES OF PHOSPHORUS

PHOSPHORIC ACID

White Phosphorus produced by Monsanto at their Monsanto, Tenn., electric furnace plant is burned in a moist atmosphere to produce Phosphoric Acid of brilliant white color and high purity. USES: Soft drinks, rustproofing compounds, metal cleaning, gelatin, jelly and preserves, fertilizer, textiles, sugar, pharmaceuticals, water treatment, manufacture of phosphates.

SODIUM PHOSPHATES

Mono Sodium
Water Treatment
Textiles

Tetra Sodium Pyro
Soap
Textiles
Detergents
Cheese
Dyeing
Bleaching
Metal Cleaning
Oil Drilling Mud
Water Treatment
Water Softener
Glass

Di Sodium
Cheese
Leather
Textiles
Detergents
Water Treatment
Dye
Pigments

Acid Sodium Pyro
Baking Powder
Oil Drilling Mud
Electroplating

Tri Sodium
Water Softener
Detergent
Metal Cleaner
Water Treatment
Textiles

Meta Sodium
Water Treatment
Detergent

Tri Poly
Detergents
Cheese
Metal Cleaner
Water Treatment

CALCIUM PHOSPHATES

Mono Calcium
Baking Powder
Self-Rising Flour
Prepared Flour
Mineral Supplement

Di Calcium
Tooth Paste

Tooth Powder
Mineral Supplement
Pharmaceutical

Tetra Calcium Pyro
Mineral Supplement
Pharmaceutical

Tri Calcium
Tooth Paste
Tooth Powder
Anti-Caking Agent
Mineral Supplement
Pharmaceutical

AMMONIUM PHOSPHATES

Mono Ammonium
Fireproofing
Yeast
Malt
Fertilizer

Di Ammonium
Fireproofing
Yeast
Fertilizer

POTASSIUM PHOSPHATES

Mono Potassium
Pharmaceuticals

Tri Potassium
Oil Refining

Di Potassium
Fermentation
Nutrient Solutions

Tetra Potassium Pyro
Soap
Textiles
Water Softener

IRON PHOSPHATES

MAGNESIUM PHOSPHATES

ALUMINUM PHOSPHATES

ALKYL ACID PHOSPHATES

ALKYL ALKALI PHOSPHATES

Monsanto, the world's largest commercial producer of phosphorus, is adding even greater capacity. This means that Monsanto phosphoric acid and phosphates will be available in increased quantities for industrial and food-products use.

A partial range of applications for Monsanto phosphorus derivatives is shown on the flow-chart above. For the complete, fascinating story of this vital element send for a copy of Monsanto's booklet "Phosphorus . . . the light bearer." If you are interested in specific applications for phosphoric acid or any of the phosphates, write to Monsanto, Phosphate Division.

MANY INDUSTRIAL USES FOR HB-40

MONSANTO'S CLEAR, MOBILE, HIGH-BOILING HYDROCARBON

Now available in commercial quantities at a reasonable price, Monsanto's HB-40 has versatile qualities of interest to a broad sector of industry. A relatively non-toxic, high-boiling, colorless hydrocarbon, HB-40 is especially recommended for plasticizing polystyrene, vinyl resins, ethyl cellulose, asphaltic materials and for softening many rubber compounds. Among the specific applications for which HB-40 has proved highly successful you will find the following:

Plasticizer for polystyrene casting resins
Plasticizer for polystyrene adhesives
Plasticizer for molding polyvinylcarbazole
Plasticizer for vinyl extrusions and adhesives
Plasticizer for ethyl cellulose injection moldings
Pasticizer for strip coatings for metals
Plasticizer for floor tile compositions
Plasticizer for asphalt base paints
Lubricant for tin plate
Diffusion pump oil
Enamel finishes
Chewing gum formulation
High-temperature lubricant
Heat-transfer medium

As a plasticizer, HB-40 imparts good tensile strength, elongation and moisture-resistant qualities. Moreover, it has excellent electrical properties and a very low order of toxicity. These qualities recommend its use for casting resins, plastics emulsions (including adhesives), plastics paint coatings and plastics extrusions. A further application in this field is the use of HB-40 as a co-plasticizer or extender for primary plasticizers selected to give outstanding low temperature and low volatility characteristics.

Full technical data on these profitable applications for HB-40 are contained in a new Monsanto Technical Bulletin (No. P-104), which also describes many additional uses in the industrial field.

Send for your copy of Monsanto Technical Bulletin No. P-104. Address Monsanto, Phosphate Division, or simply return the coupon.

News of Monsanto Chemicals for the Process Industries . . . October, 1948

Now available, Monsanto's newest plasticizer — Santicizer 141 — possesses a lower burning rate than any equally efficient plasticizer used in polyvinyl chloride films. It "flames out" in 1 second flat, compared with minimum burning rates of 38 seconds for other plasticizers having the same general characteristics.

One look at the versatile qualities of Santicizer 141 will show you its possibilities for improving your products, whether they be drapes, curtains, upholstery materials, table cloths, floor tiles, wearing apparel or any similar materials.

In addition to exceptional flame retardance, Santicizer 141 possesses the following advantages:

LOW TOXICITY . . . Tests show Santicizer 141 to be one of the least toxic of all plasticizers.

COMPATIBILITY . . . Highly compatible with vinyl resins. Can be used in varying quantities to produce compounds having a wide range of hardness and flexibility.

PERMANENCE . . . Because of its low volatility, Santicizer 141 imparts long life to any compound in which it is used.

DRAPE . . . Films containing Santicizer 141 have a high degree of softness or drape; are pliable, pleasing to the touch.

WEATHERING . . . Exposure to sunlight, rain, water and humidity do not cause excessive deterioration in properly compounded films containing Santicizer 141.

TOUGHNESS . . . Santicizer 141 contributes strength, elasticity and abrasion resistance to such products as upholstery and floor covering materials, shoe soles, luggage covering, wire jacketing.

AVAILABILITY . . . New production facilities will shortly assure ample commercial quantities of Santicizer 141, latest example of Monsanto's continuing leadership in the plasticizer field.

To obtain complete application and technical data on Santicizer 141, write to MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1703 South Second Street, St. Louis 4, Missouri. If you prefer, simply return the coupon.

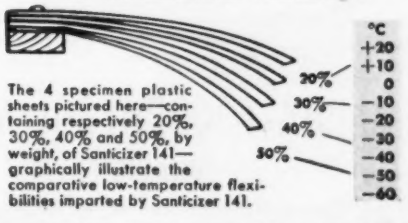
Santicizer: Reg. U. S. Pat. Off.

COMPARATIVE "FLAME-OUT" TIME

SANTICIZER 141	1 SECOND
PLASTICIZER A	38 SECONDS
PLASTICIZER B	44 SECONDS

These burning rates were determined by placing polyvinyl chloride films (each containing 30% plasticizer) directly in contact with intense flame for 30 seconds. The flame was then removed . . . The film containing Santicizer 141 supported combustion for *only 1 second*. The other two films, containing other plasticizers, supported combustion for 38 seconds and 44 seconds, respectively.

LOW-TEMPERATURE FLEXIBILITY



The 4 specimen plastic sheets pictured here—containing respectively 20%, 30%, 40% and 50%, by weight, of Santicizer 141—graphically illustrate the comparative low-temperature flexibilities imparted by Santicizer 141.

MONSANTO
CHEMICALS AND PLASTICS

MONSANTO CHEMICAL COMPANY, 1703 South Second Street, St. Louis 4, Missouri. District Sales Offices: New York, Philadelphia, Chicago, Boston, Detroit, Cleveland, Cincinnati, Charlotte, Birmingham, Houston, Akron, Los Angeles, San Francisco, Seattle, Portland. In Canada: Monsanto (Canada) Limited, Montreal.

MONSANTO CHEMICAL COMPANY
1703 South Second Street
St. Louis 4, Missouri

Please send me the further information on the following:

Name _____ Title _____

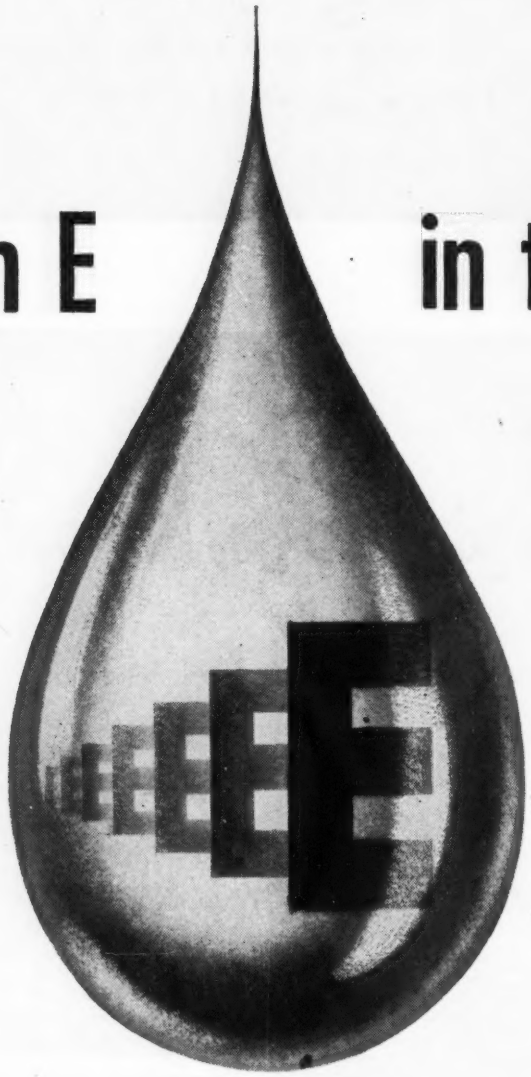
Company _____

Address _____

City _____ State _____

SERVING INDUSTRY . . . WHICH SERVES MANKIND

Vitamin E in the most acceptable dosage form



Increasing preference for administration of *high dosages* of Vitamin E presents pharmaceutical manufacturers with the important problem of supplying adequately high potencies in conveniently small dosage forms.

ALPHA-TOCOPHEROL MERCK (VITAMIN E) and ALPHA-TOCOPHEROL ACETATE MERCK provide the answer to this problem. By employing these *pure* products, you are assured of high vitamin content in dosage forms most readily acceptable to physician and patient.

Merck chemists — together with their collaborators — identified and synthesized Alpha-Tocopherol (Vitamin E) in 1938. The acetate ester, virtually identical in biological activity, was developed more recently. By using either of these materials you are making Merck experience and Merck quality component parts of your own vitamin product.

ALPHA-TOCOPHEROL MERCK
(VITAMIN E)

ALPHA-TOCOPHEROL ACETATE MERCK

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U.S.I. CHEMICAL NEWS

October ★ A Monthly Series for Chemists and Executives of the Solvents and Chemical Consuming Industries ★ 1948

American Hydrocarbon Synthesis Is New Source of Ketones

Will Make Four Ketones Commercially Available

Ketones — the water white chemicals with excellent solvent properties, used extensively as solvents, raw materials, and intermediates in a great variety of processes — are another group of chemicals to be supplied by the American Hydrocarbon Synthesis. Acetone, methyl ethyl ketone, methyl propyl ketone, and methyl butyl ketone will be obtained directly from the water soluble stream of the synthesis, and from these four ketones many other important compounds can be prepared.

Ketones Widely Used

This is good news for the plastics, protective coating, rayon, petroleum, and photographic film industries, who have been using increasing amounts of these versatile chemicals. Acetone is used in many diverse solvent operations ranging from the dissolving of acetylene gas for cylinders to the various solvent jobs it performs in the production of photographic film, artificial leather, acetate rayon, and plastics. Acetone is also a raw material in the production of chloroform and iodoform, diacetone alcohol, methyl isobutyl carbinol, mesityl oxide, indigo, sulfonal, and certain resins and plastics. Other ketones which can be prepared from acetone are: methyl isobutyl ketone, phorone, diisobutyl ketone, acetonylacetone, and isophorone. Increased availability of acetone may stimulate interest in these and other of its products.

Final polishing of sheets of transparent methyl methacrylate. Acetone, one of the ketones to come from the American Hydrocarbon Synthesis, is an important raw material in the production of this acrylic resin.

Methyl ethyl ketone is a good solvent for vinyl resins, and as such is used in the production of chemical-resistant lacquers. Another important use of methyl ethyl ketone is in the dewaxing of lubricating oils. It is a good low-boiling nitrocellulose solvent, similar in evaporating properties to ethyl acetate. Methyl ethyl ketone also plays a part in the manufacture of cleaning compounds

MORE

New Non-Hazing Alkyd Makes Mirror-Like Finishes Possible

Aroplaz 1248-M Has High Gloss and Gloss-Retention — Is Non-Hazing Even in Presence of Zinc Oxide

For the first time a pure phthalic alkyd resin which does not haze in the presence of zinc oxide has been placed on the market. Aroplaz 1248-M, a new pure, long oil, oxidizing, color- and gloss-retentive phthalic alkyd, is the latest development in the U.S.I. line of resins for the field of architectural paints and enamels. This mineral spirits soluble resin is the result of years of testing and development by U.S.I.'s laboratory and production experts. Enamels made with Aroplaz 1248-M are excellent in both color and gloss, and have outstanding gloss-retention.

Non-Hazing With Zinc Oxide

One of the most striking advantages of Aroplaz 1248-M is its high gloss-retention in the presence of zinc oxide. The characteristic weakness of alkyds up to the present time has been their tendency to develop a surface haze that diminished gloss considerably. This hazing tendency was particularly pronounced when zinc oxide was used in pigmentation. Since zinc oxide is absolutely essential to prevent yellowing of white enamels, hazing has been a serious drawback to the use of alkyds in architectural enamels.

Aroplaz 1248-M, however, in extensive tests conducted before offering it for sale commercially, showed no tendency to haze in two years of aging carried on under a variety of conditions. Besides this property of excellent gloss-retention, Aroplaz 1248-M also has improved brushing characteristics, such as ease of application, maintenance of

MORE

New Booklet Is Guide To Well-balanced Feeds

A new booklet, entitled *Proteins & Amino Acids in Animal Nutrition*, is available now for the manufacturers of feedstuffs. This guide, written by a prominent authority, is designed to enable the feed manufacturer to estimate the essential amino acid content of his feed. The availability and distribution of sulfur amino acids is certainly, the booklet states, an index of the protein quality and overall performance of the ration. A serious deficiency of only one amino acid is enough to cause failure of the entire diet, according to the author. Copies of this valuable booklet may be obtained exclusively by writing the Editor of Chemical News.

Non-breakable Containers Are Available for Acids

New plastic vials and jars, particularly adapted to the packaging of wet, oily, acidic products — and to dry products sensitive to moisture — are said to be available now in commercial quantities. The new containers, it is reported, combine the advantages of lightness in weight, freedom from breakage, new design and color effects, and durability. They are described as being odorless, tasteless, and inert. Resistance to highly corrosive hydrofluoric acid is also claimed.

Fingernails Break Easily? Here's a New Remedy

Women with extremely fragile fingernails can now look to DL-methionine for a solution of their problem, according to a noted medical authority. Use of nail polish removers containing very strong solvents tends to take the oil out of fingernails, preventing proper metabolism and causing them to become fragile, it is reported. Including a considerable amount of DL-methionine in the diet, it is claimed, is one means of combating this tendency.

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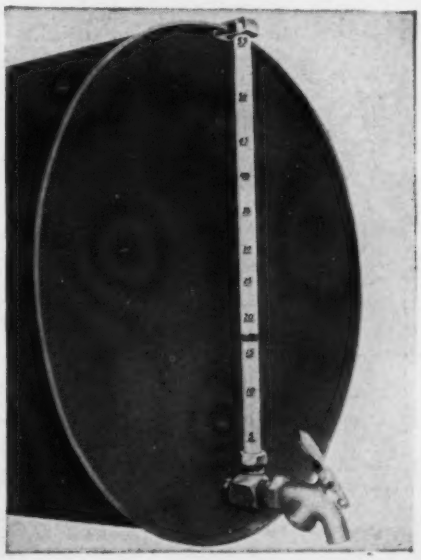
A new drum gage is now on the market for measuring the contents of 55 gallon drums. The drum reserve can be accurately estimated at a glance, according to the manufacturer's report. The gage is described as suitable for use indoors or out.



October ★ **U.S.I. CHEMICAL NEWS** ★ 1948

New Scientific Journals

Two new scientific journals are now available. They are: the *South Africa Industrial Chemist*, the official news organ of the South African Chemical Institute; and *Research, a Journal of Science and Its Applications*, published in England.

CONTINUED New Source of Ketones

and artificial leather. With methyl propyl ketone and methyl butyl ketone commercially available for the first time—through the American Hydrocarbon Synthesis—new uses will probably be developed for these effective medium-boiling solvents for vinyl resins.

The reactive carbonyl group common to all ketones makes them good starting materials in many organic syntheses. They will react readily with aldehydes, hydrocycanic acid, and amines, and so they are used extensively as raw materials and intermediates in the production of resins, plasticizers, dyes, etc.

Previous Sources

Acetone was at one time prepared by the now obsolescent method of dry distillation of calcium acetate. One commercial process employed at present for the production of acetone is the oxidation of isopropyl alcohol. Acetone is also obtained in commercial quantities as a co-product with normal butyl alcohol by the fermentation of starch or sugar. Methyl ethyl ketone has been produced by the oxidation of secondary butyl alcohol. Up to the present time methyl propyl ketone and methyl butyl ketone have been practically unobtainable in commercial quantities.

Now the American Hydrocarbon Synthesis will provide a single, dependable source of four ketones—acetone, methyl ethyl ketone, methyl propyl ketone, and methyl butyl ketone. These four compounds offer a wide range of solvent properties and possibilities for many chemical syntheses.

Discovers Method for Assaying Senna Leaf

According to a recent scientific paper, new laboratory tests on both animals and humans have led to the discovery of a method for assaying senna leaf. One of the oldest botanical medicines in the world, senna was first used as a medicine in about the ninth century, and has been used continuously ever since, chiefly in laxatives.

Until now no adequate attempts had been made to set up standards of potency for any of the forms of senna commonly used in pharmaceutical products. The recent investigations, however, are said to indicate that senna preparations can be assayed for potency on humans by tests with mice. The application of these findings, it is claimed, will permit establishment of potency specifications for the various pharmaceutical forms of senna.

ATTENTION

Users Of Specially Denatured Alcohol

Have you remembered to renew your basic permit (Treasury Department Form 1479) for 1949? If you require forms or any assistance in their preparation, call your nearest U.S.I. office.

CONTINUED Non-hazing Resin

wet edge, and proper lapping-in.

Specifications to which Aroplaz 1248-M conforms are given in the table below:

SPECIFICATIONS • AROPLAZ 1248-M

Non-Volatile: 69-71%
Solvent: Mineral Spirits
Viscosity: Z-Z2 (22.7-36.2 poises)
Acid Number of Non-Volatile: 8-12
Color (Gardner Stds. 1933): 7-9
Wt./gal. @ 25°C. (Solution): 8.05-8.15 lbs.

TECHNICAL DEVELOPMENTS

Further information regarding the manufacturers of these items may be obtained by writing U.S.I.

A new brazing process for magnesium, said to give neat joints needing little or no dressing, is claimed to be useful in joining parts too thin to be welded. **(No. 371)**

Film thickness is measured accurately to 0.00001 inches, it is claimed, by a new gage using Radioactive Carbon 14. **(No. 372)**

Hard-to-get-at surfaces in flasks are reached by a new type brush, it is reported. The brush is described as having a trigger-operated bristle portion which will pivot as much as 90° to reach any spot in the flask, the makers state. **(No. 373)**

A new acid- and oil-resistant matting, claimed to have tremendous abrasion resistance, is said to lie flat and hug the floor better than rubber does, according to the manufacturer. **(No. 374)**

A new extremely strong adhesive, said to provide a metal-to-metal bond resistant to shear tests up to 3,500 pounds per square inch, is easy to apply, long-lasting, and inert in water, oils, and most solvents, the manufacturer reports. **(No. 375)**

A new glass-painting medium, said to be easy to use and durable to washing and handling, is useful also in decorating metal, china, porcelain, and similar hard surfaces, the makers assert. **(No. 376)**

Unique mechanized galvanizing process is claimed to produce tanks giving greatly extended service over hand galvanized tanks. **(No. 377)**

A new hydrotropic agent for increasing the water solubility of insoluble or slightly soluble organic chemicals has many potential applications in the fields of plastics and resins coatings, the manufacturer asserts. **(No. 378)**

Synthetic sapphire balls, said to have a low coefficient of friction and a hardness second only to diamond, are described as acid proof and may find use in high-temperature bearing assemblies and for bearing installations subject to contact with chemical agents, it is claimed. **(No. 379)**

Wallpaper is made washable by a new resin coating which makes stains such as ink, crayon, grease, and oil easily removable with soap and water, the makers state. **(No. 380)**

Non-destructive, rapid, quantitative analysis of the elemental constituents of metals, alloys, chemical compounds, minerals and ores is made possible by a new X-ray unit, it is claimed. **(No. 381)**

A new "cold" industrial solvent is said to be very versatile in dissolving and dispersing all types of petroleum residues from metal surface. The maker claims it can be used without application of heat except in cold weather conditions. **(No. 382)**

U.S.I INDUSTRIAL CHEMICALS, INC.

60 EAST 42ND ST., NEW YORK 17, N. Y. U.S.I. BRANCHES IN ALL PRINCIPAL CITIES

ALCOHOLS
Amyl Alcohol
Butanol (Normal Butyl Alcohol)
Fusel Oil—Refined

Ethanol (Ethyl Alcohol)
Specially Denatured—all regular and anhydrous formulas
Completely Denatured—all regular and anhydrous formulas
Pure—190 proof, C.P. 96% Absolute
*Super Pyro Anti-freeze
*Solox proprietary Solvent

***ANSOLS**
Ansol M
Ansol PR

ACETIC ESTERS
Amyl Acetate
Butyl Acetate
Ethyl Acetate

OXALIC ESTERS
Dibutyl Oxalate
Diethyl Oxalate

PHTHALIC ESTERS
Diamyl Phthalate
Dibutyl Phthalate
Diethyl Phthalate

OTHER ESTERS
*Diatol
Diethyl Carbonate
Ethyl Chloroformate

INTERMEDIATES
Acetoacetanilide
Acetoacet-ortho-anisidide
Acetoacet-ortho-chloroanilide
Acetoacet-ortho-toluidide
Acetoacet-para-chloroanilide
Ethyl Acetoacetate
Ethyl Benzoylacetate
Ethyl Sodiumoxalacetate

ETHERS
Ethyl Ether
Ethyl Ether Absolute—A.C.S.

FEED CONCENTRATES
Riboflavin Concentrates *Vacatone 40
*Curbay B-G *Special Liquid Curbay

ACETONE
Chemically Pure

RESINS (Synthetic and Natural)
*Aroplaz—alkyds and allied materials
*Arofene—pure phenolics
*Arochem—modified types
Ester Gums—all types
Congo Gums—raw, fused & esterified
Natural Resins—all standard grades

INSECTICIDE MATERIALS
*Pyrenone Concentrates
Pyrethrum Products
Rotenone Products

INSECTIFUGE MATERIALS
*Indalone
*Dimelone
Triple-Mix Repellents

OTHER PRODUCTS
Collodions Urethane, U.S.P.
Nitrocellulose Solutions DL-Methionine
Ethylene.

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U.S.I. CHEMICAL NEWS

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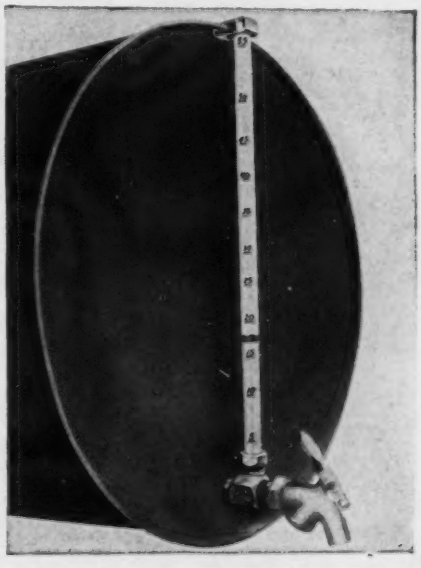


October ★ **U.S.I. CHEMICAL NEWS** ★ 1948

New Scientific Journals

Two new scientific journals are now available. They are: the *South Africa Industrial Chemist*, the official news organ of the South African Chemical Institute; and *Research, a Journal of Science and Its Applications*, published in England.

CONTINUED

New Source of Ketones

and artificial leather. With methyl propyl ketone and methyl butyl ketone commercially available for the first time—through the American Hydrocarbon Synthesis—new uses will probably be developed for these effective medium-boiling solvents for vinyl resins.

The reactive carbonyl group common to all ketones makes them good starting materials in many organic syntheses. They will react readily with aldehydes, hydrocycanic acid, and amines, and so they are used extensively as raw materials and intermediates in the production of resins, plasticizers, dyes, etc.

Previous Sources

Acetone was at one time prepared by the now obsolescent method of dry distillation of calcium acetate. One commercial process employed at present for the production of acetone is the oxidation of isopropyl alcohol. Acetone is also obtained in commercial quantities as a co-product with normal butyl alcohol by the fermentation of starch or sugar. Methyl ethyl ketone has been produced by the oxidation of secondary butyl alcohol. Up to the present time methyl propyl ketone and methyl butyl ketone have been practically unobtainable in commercial quantities.

Now the American Hydrocarbon Synthesis will provide a single, dependable source of four ketones—acetone, methyl ethyl ketone, methyl propyl ketone, and methyl butyl ketone. These four compounds offer a wide range of solvent properties and possibilities for many chemical syntheses.

Discovers Method for Assaying Senna Leaf

According to a recent scientific paper, new laboratory tests on both animals and humans have led to the discovery of a method for assaying senna leaf. One of the oldest botanical medicines in the world, senna was first used as a medicine in about the ninth century, and has been used continuously ever since, chiefly in laxatives.

Until now no adequate attempts had been made to set up standards of potency for any of the forms of senna commonly used in pharmaceutical products. The recent investigations, however, are said to indicate that senna preparations can be assayed for potency on humans by tests with mice. The application of these findings, it is claimed, will permit establishment of potency specifications for the various pharmaceutical forms of senna.

ATTENTION

Users Of Specially Denatured Alcohol

Have you remembered to renew your basic permit (Treasury Department Form 1479) for 1949? If you require forms or any assistance in their preparation, call your nearest U.S.I. office.

CONTINUED

Non-hazing Resin

wet edge, and proper lapping-in.

Specifications to which Aroplaz 1248-M conforms are given in the table below:

SPECIFICATIONS • AROPLAZ 1248-M

Non-Volatile: 69-71%
Solvent: Mineral Spirits
Viscosity: Z-Z2 (22.7-36.2 poises)
Acid Number of Non-Volatile: 8-12
Color (Gardner Stds. 1933): 7-9
Wt./gal. @ 25°C. (Solution): 8.05-8.15 lbs.

TECHNICAL DEVELOPMENTS

Further information regarding the manufacturers of these items may be obtained by writing U.S.I.

A new brazing process for magnesium, said to give neat joints needing little or no dressing, is claimed to be useful in joining parts too thin to be welded. **(No. 371)**

Film thickness is measured accurately to 0.00001 inches, it is claimed, by a new gage using Radioactive Carbon 14. **(No. 372)**

Hard-to-get-at surfaces in flasks are reached by a new type brush, it is reported. The brush is described as having a trigger-operated bristle portion which will pivot as much as 90° to reach any spot in the flask, the makers state. **(No. 373)**

A new acid- and oil-resistant matting, claimed to have tremendous abrasion resistance, is said to lie flat and hug the floor better than rubber does, according to the manufacturer. **(No. 374)**

A new extremely strong adhesive, said to provide a metal-to-metal bond resistant to shear tests up to 3,500 pounds per square inch, is easy to apply, long-lasting, and inert in water, oils, and most solvents, the manufacturer reports. **(No. 375)**

A new glass-painting medium, said to be easy to use and durable to washing and handling, is useful also in decorating metal, china, porcelain, and similar hard surfaces, the makers assert. **(No. 376)**

Unique mechanized galvanizing process is claimed to produce tanks giving greatly extended service over hand galvanized tanks. **(No. 377)**

A new hydrotropic agent for increasing the water solubility of insoluble or slightly soluble organic chemicals has many potential applications in the fields of plastics and resins coatings, the manufacturer asserts. **(No. 378)**

Synthetic sapphire balls, said to have a low coefficient of friction and a hardness second only to diamond, are described as acid proof and may find use in high-temperature bearing assemblies and for bearing installations subject to contact with chemical agents, it is claimed. **(No. 379)**

Wallpaper is made washable by a new resin coating which makes stains such as ink, crayon, grease, and oil easily removable with soap and water, the makers state. **(No. 380)**

Non-destructive, rapid, quantitative analysis of the elemental constituents of metals, alloys, chemical compounds, minerals and ores is made possible by a new X-ray unit, it is claimed. **(No. 381)**

A new "cold" industrial solvent is said to be very versatile in dissolving and dispersing all types of petroleum residues from metal surface. The maker claims it can be used without application of heat except in cold weather conditions. **(No. 382)**

U.S.I INDUSTRIAL CHEMICALS, INC.

60 EAST 42ND ST., NEW YORK 17, N. Y. U.S.I. BRANCHES IN ALL PRINCIPAL CITIES

ALCOHOLS
Amyl Alcohol
Butanol (Normal Butyl Alcohol)
Fusel Oil—Refined

Ethanol (Ethyl Alcohol)
Specially Denatured—all regular and anhydrous formulas
Completely Denatured—all regular and anhydrous formulas
Pure—190 proof, C.P. 96% Absolute
*Super Pyro Anti-freeze
*Solox proprietary Solvent

***ANSOLS**
Ansol M
Ansol PR

*Registered Trade Mark

ACETIC ESTERS
Amyl Acetate
Butyl Acetate
Ethyl Acetate

OXALIC ESTERS
Dibutyl Oxalate
Diethyl Oxalate

PHTHALIC ESTERS
Diamyl Phthalate
Dibutyl Phthalate
Diethyl Phthalate

OTHER ESTERS
*Diatol
Diethyl Carbonate
Ethyl Chloroformate

INTERMEDIATES
Acetoacetanilide
Acetoacet-ortho-anisidide
Acetoacet-ortho-chloroanilide
Acetoacet-ortho-toluidide
Acetoacet-para-chloroanilide
Ethyl Acetoacetate
Ethyl Benzoylacetate
Ethyl Sodiumoxalacetate

ETHERS
Ethyl Ether
Ethyl Ether Absolute—A.C.S.

FEED CONCENTRATES
Riboflavin Concentrates *Vacatone 40
*Curbay B-G *Special Liquid Curbay

ACETONE
Chemically Pure

RESINS (Synthetic and Natural)
*Aroplaz—alkyds and allied materials
*Arofene—pure phenolics
*Arochem—modified types
Ester Gums—all types
Congo Gums—raw, fused & esterified
Natural Resins—all standard grades

INSECTICIDE MATERIALS
*Pyrenone Concentrates
Pyrethrum Products
Rotenone Products

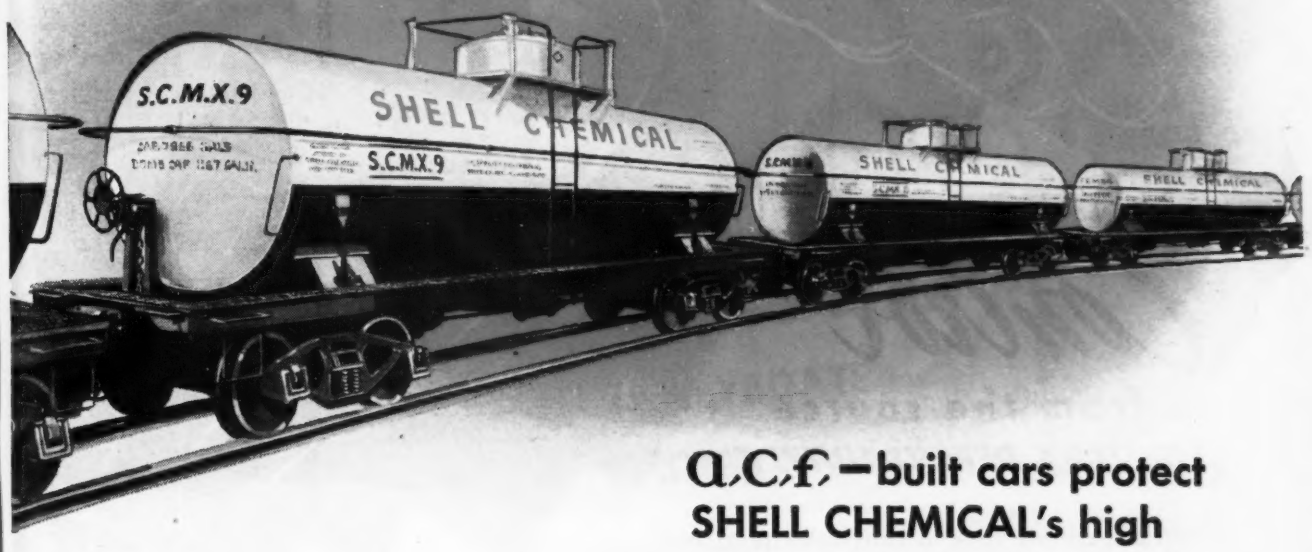
INSECTIFUGE MATERIALS
*Indalone
*Dimelone
Triple-Mix Repellents

OTHER PRODUCTS
Collodions Urethane, U.S.P.
Nitrocellulose Solutions DL-Methionine
Ethylene

Printed in U.S.A.

ALUMINUM TANKS

FOR SYNTHETIC glycerine



a.c.f.—built cars protect SHELL CHEMICAL's high purity glycerine in transit

In the first commercial synthetic glycerine plant ever built, Shell Chemical is now manufacturing the highest purity glycerine ever made in quantity.

To protect its premium quality in transit, Shell Chemical drew up the most rigid tank car specifications, and a.c.f. car building skill met them with a fleet of Aluminum Tank Cars. Specially built and fiberglas insulated, they protect this record purity from the plant to the user's door.

Building such rolling stock for Shell Chemical, and other leading Shippers and Railroads, is a continuing demonstration of a.c.f. leadership in railroad car construction.

American Car and Foundry Company, New York · Chicago · St. Louis
Cleveland · Washington · Philadelphia · Pittsburgh · San Francisco

a.c.f. CAR BUILDERS TO AMERICA'S RAILROADS

Control

from the source insures ***DEPENDABILITY***

From phosphate rock to finished chemicals ...from mining operation to you... V-C conducts every phase of phosphate chemical production. V-C's raw-material-to-finished-product facilities allow the rigid controls that guarantee dependable quality... every time!

VIRGINIA-CAROLINA CHEMICAL CORPORATION
RICHMOND, VIRGINIA

VC CHEMICALS

Write for your copy of the New V-C Chemicals Product Book

V-C CHEMICALS
PHOSPHORIC ACIDS *(All Grades)*
SODIUM PHOSPHATES
CALCIUM PHOSPHATES

V-C SODIUM PHOSPHATES OF HIGHEST QUALITY

TRISODIUM PHOSPHATE

DISODIUM PHOSPHATE
Anhydrous

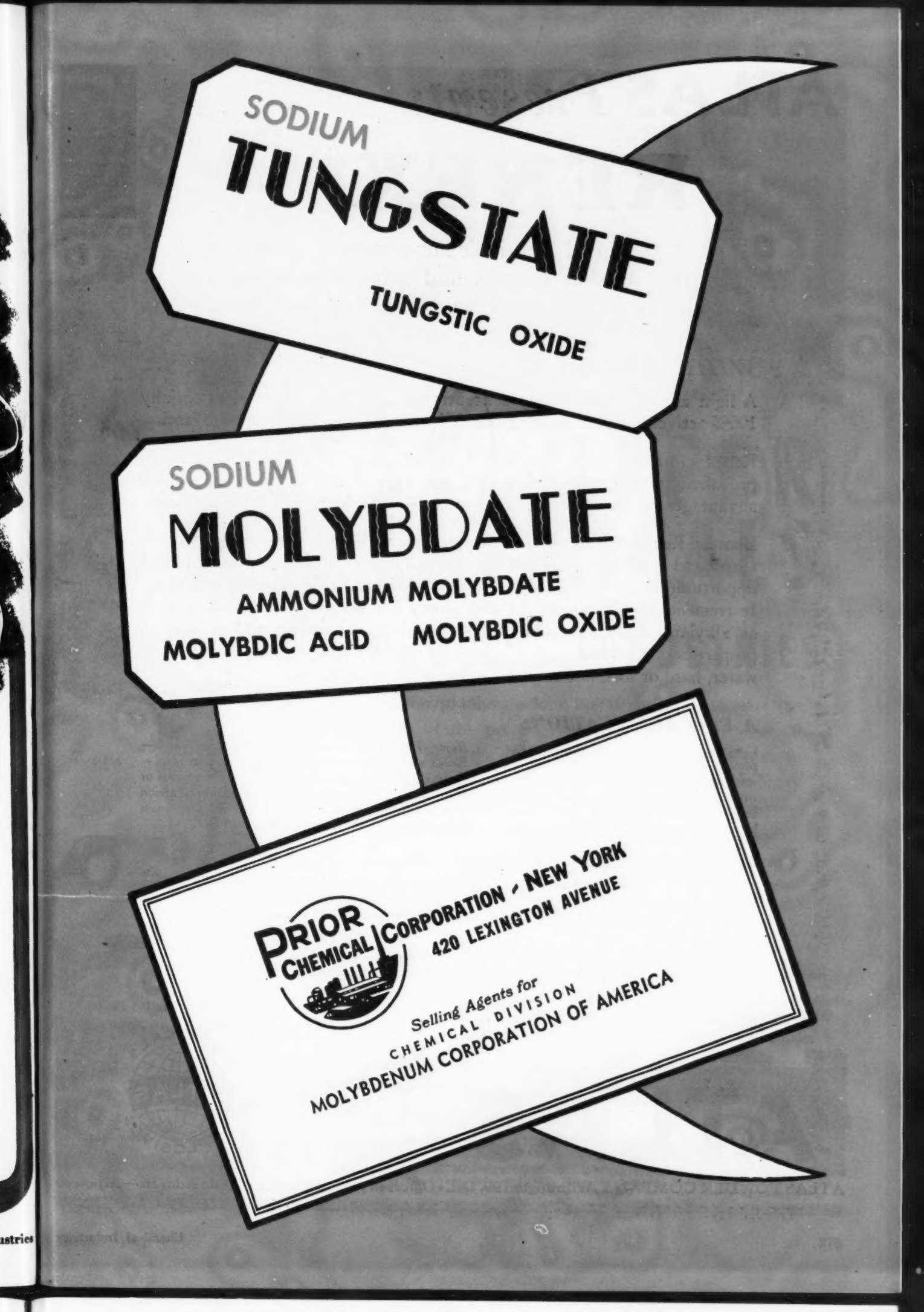
DISODIUM PHOSPHATE
Drug Grade

TETRASODIUM PYROPHOSPHATE

SODIUM TRIPOLYPHOSPHATE

CONTAINERS: Multiwall paper bags of 100 lbs. net weight each

HAND IN HAND WITH INDUSTRY


SODIUM
TUNGSTATE
TUNGSTIC OXIDE
SODIUM
MOLYBDATE
AMMONIUM MOLYBDATE
MOLYBDIC ACID
MOLYBDIC OXIDE
PRIOR CHEMICAL CORPORATION · NEW YORK
420 LEXINGTON AVENUE
Selling Agents for
CHEMICAL DIVISION
MOLYBDENUM CORPORATION OF AMERICA

ATLAS *Presents*

RENEX*

A powerful non-ionic, non-sudsing detergent that washes cottons and gives new avenues of approach to age-old cleaning problems.

WHAT RENEX IS

A light amber liquid, highly concentrated in detergent power, essentially 100% active. It is neutral in pH, non-irritating to the skin, harmless to fabrics.

Renex cleans without foaming—a radical departure from theories still prevalent in many industries. This new type of action offers exceptional advantages in several fields of application—new sales ideas for compounders.

Because Renex is non-ionic, it is compatible with both anionic and cationic soaps and stable to acid and alkaline solutions, thus giving outstanding opportunities for low-cost compounding of either liquid or powder cleaners. It tremendously increases the detergency and solubility of anionics such as alkylaryl sulfonates, and improves solubility, rinsing and germicidal properties of the cationics. Of course, it is efficient in virtually any kind of water, hard or soft, hot or cold.

A FEW APPLICATIONS

Commercial Laundering—Renex has proved its high merit in this field, in the washing of highly-soiled cottons as well as woolens and fine fabrics. Standardizes wash-room procedure. Already in use by many large laundries in preference to soaps.

Home Laundering and Dishwashing Compounds—Renex makes non-sudsing compounds that are ideal—especially for new automatic laundering machines or dish-washers. No foam to slow down mechanical action or to bubble over on milady's floor. No soap-scum in hard water. Fast draining. Kind to hands.

Also . . .Textile Scouring Agents
Wall and Paint Cleaners
Auto Cleaners
Dairy Cleaners
General Household Cleaners
Dry Cleaning Compounds
Bottle Cleaners
Metal Cleaners

Write to Atlas for bulletin giving details of Renex performance and suggestions for compounding.

JOBBERS! *We will welcome your inquiries on sales possibilities in various industries or geographical locations.*

*Reg. U. S. Pat. Off.

ATLAS INDUSTRIAL CHEMICALS DEPARTMENT

ATLAS POWDER COMPANY, Wilmington 99, Del. • *Offices in principal cities* • *Cable Address—Atpowco*

STAUFFER CHEMICALS

FOR THE PROCESS INDUSTRIES

Stauffer produces a long list of chemicals to meet the needs of the process industries. With more than 30 plants in all the principal industrial areas from coast to coast, Stauffer is geared to serve American industry wherever located. Call the nearest Stauffer office on your next chemical requirement . . . each office is staffed with technical executives ready to serve you intelligently and efficiently.

PRODUCTS

Boric Acid—Borax
Tartaric Acid
Cream of Tartar
Citric Acid
Titanium Trichloride
Carbon Bisulphide
Carbon Tetrachloride
Caustic Soda
Chloride
Silicon Tetrachloride
Sulphur
Sulphur Chloride
Textile Stripper
Sulphuric Acid
Sodium Hydrosulphide
Also
DDT—Dichloro-Diphenyl-Trichloroethane
BHC—Benzene Hexachloride
*Toxaphene—Chlorinated Camphene

STAUFFER *Guaranteed by its name*

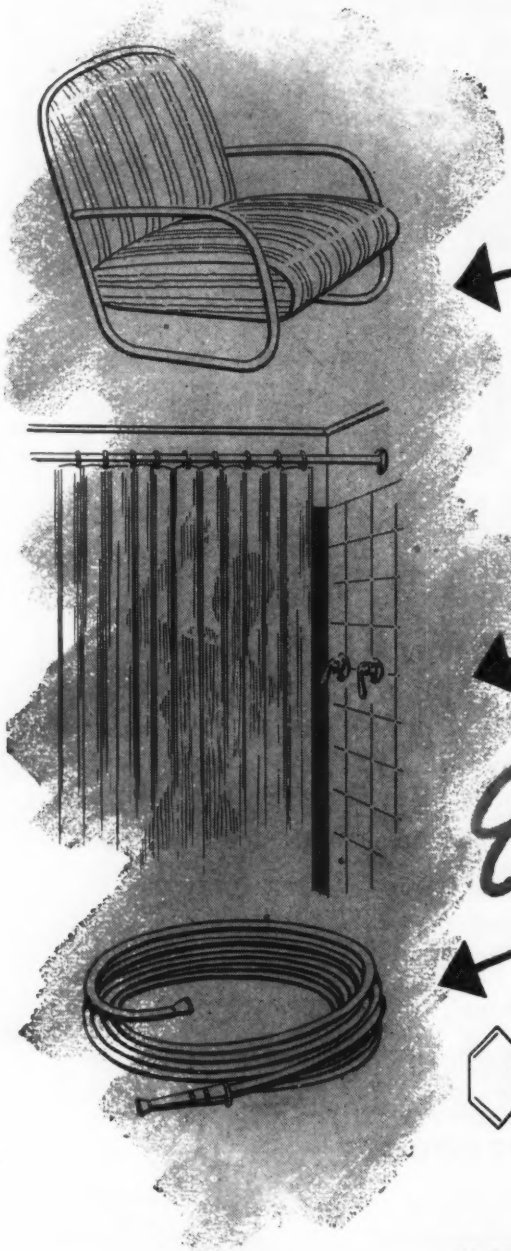
STAUFFER CHEMICAL COMPANY

420 Lexington Avenue, New York 17, N. Y. • 555 S. Flower Street, Los Angeles 13, Calif.
221 N. LaSalle Street, Chicago 1, Ill. • 636 California Street, San Francisco 8, Calif.
424 Ohio Building, Akron 8, Ohio • Apopka, Fla. • North Portland, Ore.
Houston, Texas • Weslaco, Texas

*T. M. Reg. Hercules Powder Co.

BARRETT PLASTICIZER 50-B

FOR COMPOUNDING AND PROCESSING

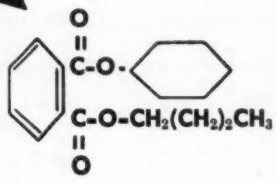


Supported

Unsupported Vinyl Film

AND

Extruded Products



Color: Clear, practically water-white (Hazen, 50 max.)
Form: Liquid
Odor: Mild Ester
Distillation at 5 mm. hg, °C.: 189-222
Specific Gravity 25/25°C.: 1.076
Pounds per Gallon at 25°C.: 8.95
Refractive Index at 20°C.: 1.5071
Viscosity, Centipoises:
at 5°C.: 467 - at 25°C.: 87.0 - at 50°C.: 22.8
Containers: 50-55 gal. non-returnable steel barrels

PLASTICIZER 50-B is compatible with polyvinyl chloride, polyvinyl acetate and copolymers, polystyrene, polyvinyl butyral, ethyl cellulose, cellulose nitrate, chlorinated rubber and butadiene—acrylonitrile copolymers.

This new plasticizer is of particular value in the compounding and processing of supported and unsupported vinyl films and extruded products. It aids in providing a soft hand, high gloss and clarity to finished materials. Its excellent compatibility and good wetting action during processing help to eliminate calendering and extruding difficulties.

Stocks plasticized with Plasticizer 50-B have high dielectric strength, increased resistance to water absorption and to extraction by mineral oil and good light and heat stability.

DIBUTYL PHTHALATE — A clear, high-boiling, water-white liquid widely used as a modifying agent and plasticizer for synthetic elastomers and natural and synthetic resins.

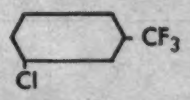
DICYCLOHEXYL PHTHALATE — A white, granular plasticizer used in supported and unsupported vinyl films. Imparts increased toughness and tear strength and materially aids processing.

Barrett

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.
In Canada: The Barrett Company, Ltd., 5551 St. Hubert St., Montreal, Que.

For Reactions Requiring Chlorotoluene Derivatives Hooker Gives You Multiple Choice

HOOKER RESEARCH PRESENTS
m-CHLOROBENZOTRIFLUORIDE
(m-chlorotrifluoromethylbenzene)



Molecular Weight	180.56
Freezing Point	−56°C
Boiling Point	138°C
Specific Gravity 15.5°C/15.5°C	1.351
Refractive Index n20/D	1.446

The physical and chemical properties of m-chlorobenzotrifluoride indicate the possibility of many applications as a dye intermediate, chemical intermediate, solvent and dielectric fluid.

m-chlorobenzotrifluoride is a water white, mobile, aromatic liquid. It is characterized by the trifluoromethyl radical which is generally stable to heat, light and to chemical reaction.

Hooker m-Chlorobenzotrifluoride is available in experimental quantities.

Technical Data Sheet No. 364 describes more completely its physical and chemical properties. Please use your company letterhead when requesting literature or samples.

Manufacture of chlorotoluene derivatives is natural for Hooker. High purity chlorine from the Hooker "S" cell is readily available. Raw materials are carefully selected to be of highest quality. Chlorination techniques have been developed over a long period of years. Hooker combines all these factors to produce many different high quality chlorotoluene derivatives. From the dozens of these compounds available, you should have no difficulty in selecting those that will be best for your reactions—from the standpoint of ease of handling, yield and cost.

Listed here are a few of these chlorotoluene derivatives and their usefulness in organic syntheses. Technical Data Sheets and samples are available when requested on your business letterhead. Bulletin 320, also available on request, gives more detailed information on the reactions of Hooker Chlorotoluenes.

PRODUCT	FORMULA	DESCRIPTION	REACTIONS
Benzoyl Chloride	C_6H_5COCl	Clear, colorless liquid	To introduce benzoyl group into organic compounds. Reacts with alcohol to form esters. To form ketones in Friedel-Crafts reactions. Reacts with ammonia, amines and benzene.
Benzyl Alcohol, Tech.	$C_6H_5CH_2OH$	Clear, colorless to light yellow liquid	As a source of benzyl group. For production of esters.
Benzyl Chloride	$C_6H_5CH_2Cl$	Clear, colorless to light yellow liquid	Source of benzyl group. In Friedel-Crafts reactions. For production of mixed ethers, esters. Reacts with alcohols, anilines, sodium cyanide, sodium sulfhydrate, sodium sulfide.
Methyl Benzoate	$C_6H_5COOCH_3$	Clear, colorless liquid	As a source of benzoyl group.
Monochlorotoluene	$CH_3C_6H_4Cl$	Clear, colorless to straw colored liquid. A mixture of ortho and para isomers.	Reacts to form chlorobenzyl, chlorobenzal, chlorobenzenyl, and chlorobenzoyl compounds.

OTHER HOOKER CHLOROTOLUENE DERIVATIVES

Benzal Chloride · Benzoic Acid · Benzoic Anhydride
Benzoate of Soda · Benzotrichloride · Benzyl Thiocyanate

From the Salt of the Earth

HOOKER ELECTROCHEMICAL COMPANY

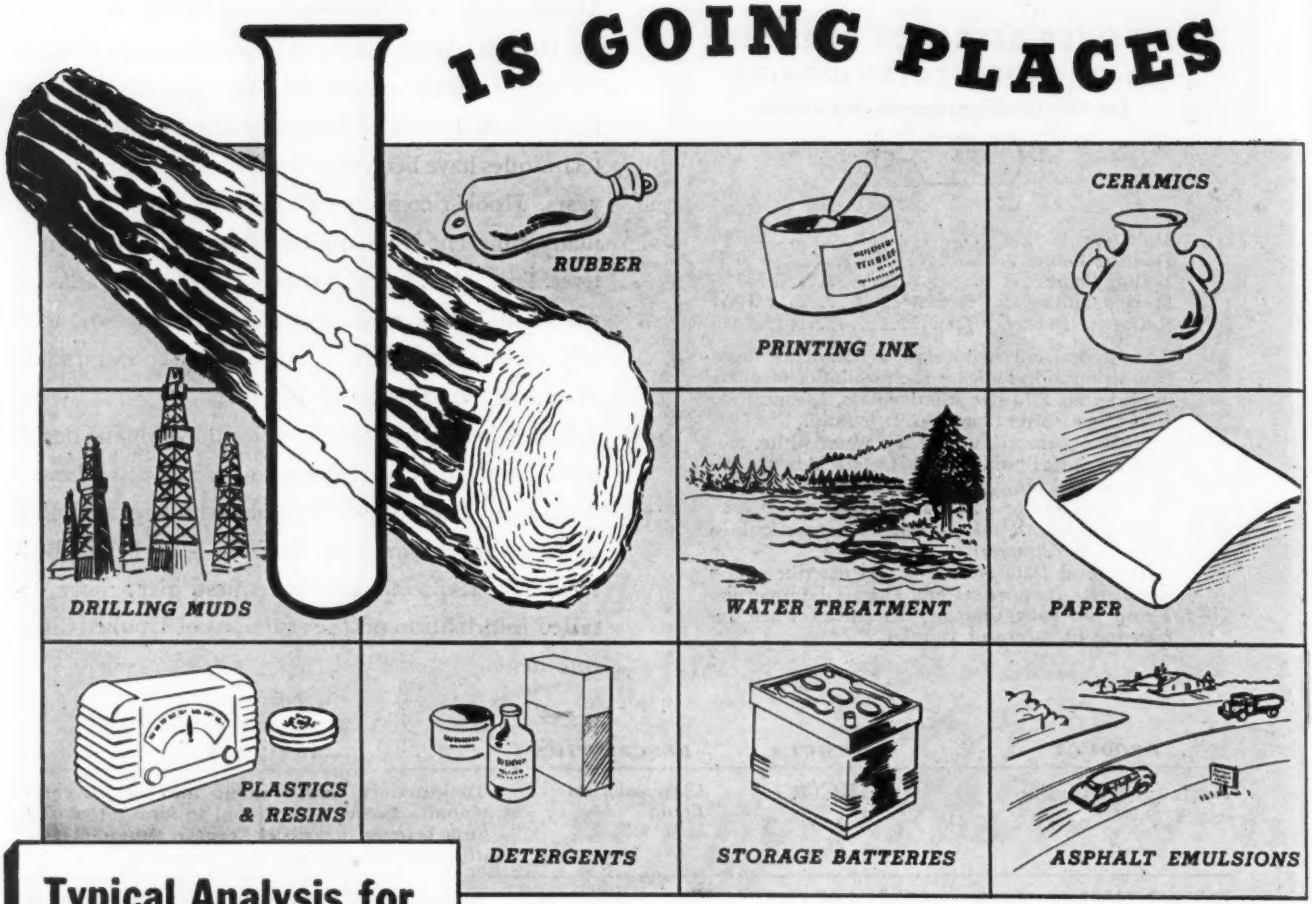
HOOKER CHEMICALS

3 FORTY-SEVENTH ST., NIAGARA FALLS, N. Y. B-952
NEW YORK, N. Y. • WILMINGTON, CALIF. • TACOMA, WASH.

Caustic Soda · Muriatic Acid · Sodium Sulfide · Paradichlorobenzene · Sodium Sulfhydrate · Chlorine

INDULIN *(SULFATE LIGNIN)*

IS GOING PLACES



Typical Analysis for Indulin A and Indulin C

TESTS (dry basis except moisture)	INDULIN A	INDULIN C
Moisture, %	4.3	8.3
Ash, %	0.4	19.1
pH	3.4	9.3
Methoxyl, % CH_3O	13.9	11.5
Sulphur, %	1.4	1.8
Apparent Density, lbs. per cubic foot	25.0	25.0
Specific gravity	1.3	1.3

Since 1944 INDULIN (a lignin derived from pine wood) has been produced in two standard grades at our Charleston, S. C. lignin plant. These uniform reproducible grades, INDULIN "A" and INDULIN "C", have since stimulated wide interest in diversified fields of industry that have need for abundantly available, inexpensive, product-improvers.

INDULIN may be readily etherified, esterified, nitrated, mercurated, and halogenated. It reacts readily with phenols, amines, and aldehydes; sulphur, sulfides, and sulfites. INDULIN is insoluble in water and acidic solutions but is soluble in caustic alkalies such as sodium-hydroxide, ammonia, and various amines.

Our Development Department has just completed a new bulletin on the many uses for INDULIN in industry. Fill out the coupon today for your free copy.

INDUSTRIAL CHEMICAL SALES Dept. CI
230 Park Ave., New York 17, New York

Send new Bulletin L-5 "Indulin—Lignin From Pine Wood."

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Address .....

City..... Zone..... State.....

industrial CHEMICAL SALES

division west virginia pulp and paper company

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Public Ledger Bldg. Independence Square Philadelphia 6, Pa.
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(Diamond Alkalies are "Behind the Scenes" of American Industry)

Modern Fabrics

made more attractive

and durable

with

Diamond Alkalies

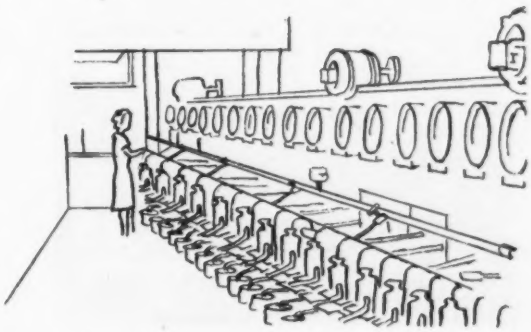
Modern fabrics made of wool, rayon, cotton and linen are constantly being improved in appearance and durability, with the aid of these dependable Diamond alkalies . . .

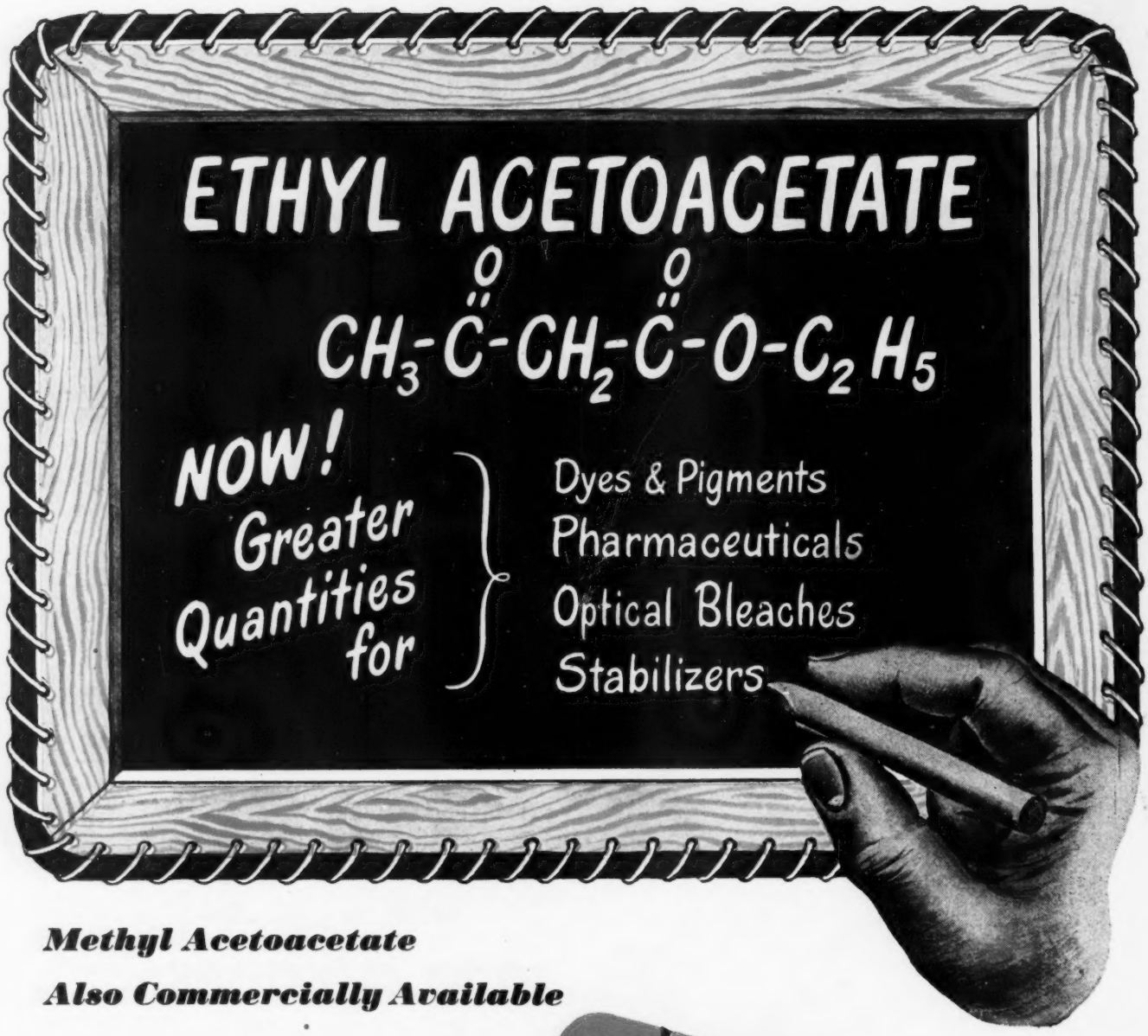
- CAUSTIC SODA for mercerizing and kier boiling cotton. Also, an important raw material used in production of rayon.
- SODA ASH for washing fabrics, neutralizing acids, softening water.
- SILICATES OF SODA for silk weighting, detergents, peroxide bleaching.
- LIQUID CHLORINE for preparation of bleaching agent.
- CHLOROWAX for wafer resistance, fire retardance.

Thus, Diamond alkalies help the Textile industry meet the fabric needs of America and the world.

DIAMOND ALKALI Chemical Products

DIAMOND ALKALI COMPANY
CLEVELAND 14, OHIO

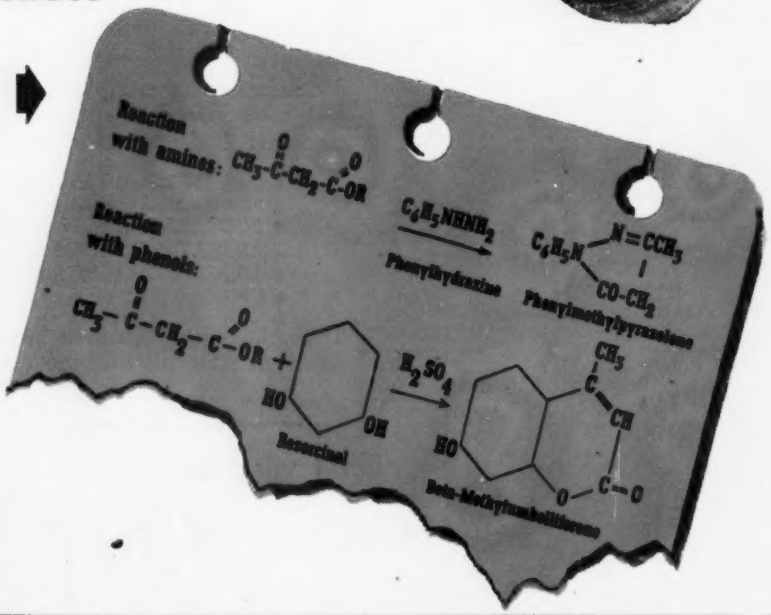




Methyl Acetoacetate

Also Commercially Available

The many possibilities of these esters are shown by these typical industrial reactions.



CARBIDE and CARBON CHEMICALS CORPORATION

Unit of Union Carbide and Carbon Corporation

30 East 42nd Street UCC New York 17, N. Y.

Offices in Principal Cities

In Canada:

Carbide and Carbon Chemicals, Limited, Toronto

OTHER ACETOACETATES, SUCH AS BUTYL AND METHYL AMYL ESTERS, can be supplied. You are invited to call or write our nearest office for samples, prices, and additional helpful data on acetoacetic esters.

Chemical Industries

THE MAGAZINE OF THE CHEMICAL PROCESS INDUSTRIES

For Your Information:

Newsletter,
October, 1948

Rohm & Haas Co. is making acrylic intermediates—reportedly ethylene cyanhydrin and acetone cyanhydrin—at its new Houston plant. These materials are prepared from hydrogen cyanide, made by the reaction of methane and ammonia, and suitable organic intermediates. The products are further processed elsewhere in the company's facilities.

A new copolymer resin emulsion for permanent stiffening of cottons, Polyco 337, will soon be announced by American Polymer Corp., Peabody, Mass. Unlike urea or melamine resins, the material does not require curing, can be applied easily by the industrial finisher, commercial laundry, or housewife. Cottons so treated are simply ironed to give them a starched-like finish.

* * CI * *

Two U. S. patents (Nos. 2,442,323-4) recently issued to Dow Chemical Co. are of interest in light of Dow's production of perchloroethylene at Freeport, Texas. Methane is chlorinated in the presence of carbon tetrachloride, which absorbs the heat of reaction. More than the theoretical yield (based on methane) is obtained because some of the carbon tetrachloride is converted into the desired product. Higher hydrocarbons—ethane and propane—can also be chlorinated to give predominantly either carbon tetrachloride or perchloroethylene, depending on the reaction conditions. Conversion of propane to the two products totals 94 per cent.

Koppers Co. will shortly announce the first commercial availability of isopropyl phenol. The material is now in pilot plant and is expected to be competitive with cresol for certain uses.

* * CI * *

The McCarthy Chemical Co. plant at Winnie, Texas, will start operating this month to produce formaldehyde, acetaldehyde and methanol. The tonnage-oxygen unit for the process has been installed. The Cycloversion plant of Absorption Plant, Inc. (another of the Glenn McCarthy enterprises, also at Winnie) is now in operation for gasoline production.

Oronite Chemical Co. is actively developing toluic acid and is placing samples for market evaluation. The material is a mixture of the various toluic acid isomers.

* * CI * *

Operation of Stanton Chemicals, Inc.'s plant, now under construction at Corpus Christi, is scheduled to begin in a few weeks. First products will be aromatic hydrocarbons--benzene, toluene and mixed xylenes--and a paraffin cut which will be oxidized in the vapor phase to fatty acids. A distillate cut will be purchased as charging stock, and some fuel oil will be recovered from the process residue. The fatty acids will be converted into soaps for grease manufacture. Shortly after the first of the year Stanton expects to add phthalic anhydride and anthraquinone, made by air oxidation of naphthalene and anthracene, respectively. Over-all investment: $750,000.

Watch for an announcement later this year of another new non-flammable hydraulic fluid, developed cooperatively by two well-known companies in the chemical and aircraft fields.

* * CI * *

Bakelite Corp. is considering construction of a plant on the new 1,200-acre site near Marietta, Ohio, where Electromet and National Carbon, other members of the Union Carbide group, have already announced plans for a ferroalloys plant and a carbon electrode plant.

Frontier Chemical Co. is installing equipment at its Midland, Texas, plant for production of solid and flake caustic soda. Heretofore all its caustic production has been sold in liquid form.

* * CI * *

Here and There:

Botany Mills is investigating the production of cholesterol and cystine. It has just announced availability in research quantities of a high-cystine protein, containing 12 per cent cystine, under the name Botanein-P...Foreign production of penicillin, now expanding at a rapid rate, is starting to make its influence felt on United States exports...Interest in trichloropropane will be heightened by Shell's announcement of a 6 cents-per-lb. price--lower than ethylene dichloride and methylene dichloride, competing chlorinated solvents...A $2,000,000 plant is being built in the Houston area by Wright Manufacturing Company, an affiliate of Taylor Manufacturing Co., Milwaukee. First products will be synthetic and natural rubber floor tiling; fabrication of plastics will follow later...If ethylene glycol output during the latter part of the year follows the pattern of the earlier portion, a surplus of several million gallons may develop. Production cutbacks or further shift to glycol antifreeze may, however, bring demand into line with the apparent oversupply...New processes for hydrazine manufacture may bring the cost down to as low as 50 cents a pound.

The Editors

Now available in quantity...

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THE POINT ABOUT BASING POINTS

by ROBERT L. TAYLOR, Editor

NOW THAT THE BASING POINT PRICING controversy has ceased boiling as hard as it was, some of the fundamentals involved are beginning to settle out and become more clearly discernible. The question arises as to whether the difference between the effects of basing point pricing and f.o.b. pricing as they work out in actual practise have perhaps been unduly magnified in relation to other considerations.

Without going into great detail, here is the picture as we see it:

In a sellers' market there is a natural tendency for sellers using the basing point system to draw in the boundaries of their markets in order to save freight. Equalization of freight becomes an unnecessary expense, and the less business done that requires it the better. So actually at such times basing point pricing tends to become f.o.b. pricing.

In a buyers' market the situation is reversed. As demand falls off and competition becomes keener, sellers have a choice between two methods by which they can attempt to hold their share of the market. They can lower prices, or they can increase sales effort and service. Or they can do some of both.

How far any individual seller can go in either direction depends on a combination of how low he can get his operating costs and how well heeled he is financially. The general tendency among sellers in a declining market is first to try to maintain both market and prices by increasing sales effort. Price reductions, unless indicated by substantial drops in costs, are generally reserved for second lines of defense. No seller is anxious to get into a dog-eat-dog price war.

It is doubtful if the pricing policy that happens to be in effect, whether basing point or f.o.b., is going to make much difference in the above process. Freight equalization under the basing point system is a competitive tool to help a seller maintain his share of a market. As such it is an item of expense that is paid for equally by all customers. If it is ruled out as a tool, then the same producer will probably resort to other selling devices, as long as he can, to maintain his share of the market. They may take the form of additional advertising, or more intensive coverage of sales territories. But these, too, are items of expense that are paid for equally by all customers. Their economic function is identical with that of freight equalization. They are all tools in the job of competitive selling.

Whether or not one of these tools is legislated out of existence, does not seem likely to greatly affect either our economic system or the prices people pay for goods. But—and we believe this is the important point—if such legislation should prove to be a foot in the door to rule out other tools of competition which a government agency or court decides are unnecessary, it would be a resounding blow to free enterprise.

Chemical Progress Under Socialism

SPEAKING OF GOVERNMENT REGULATION of business, the following excerpts from a letter to *The Times* of London may give solace to some U. S. businessmen:

"I am a soapmaker. For 30 years I have been trying to make soap mechanically and by a continuous process. In December, 1946, I bought an American plant which seemed to fulfill by dreams. My chemist went to America and I followed; and in June, 1947, I obtained an almost perfect commercial contract stipulating that the plant I had purchased would make soap of as good or better quality than any other plant, with 25 p.c. of the coal used in the conventional processes, and would save labour. If the plant did not fulfill these conditions the makers agreed to take it away free of cost to me.

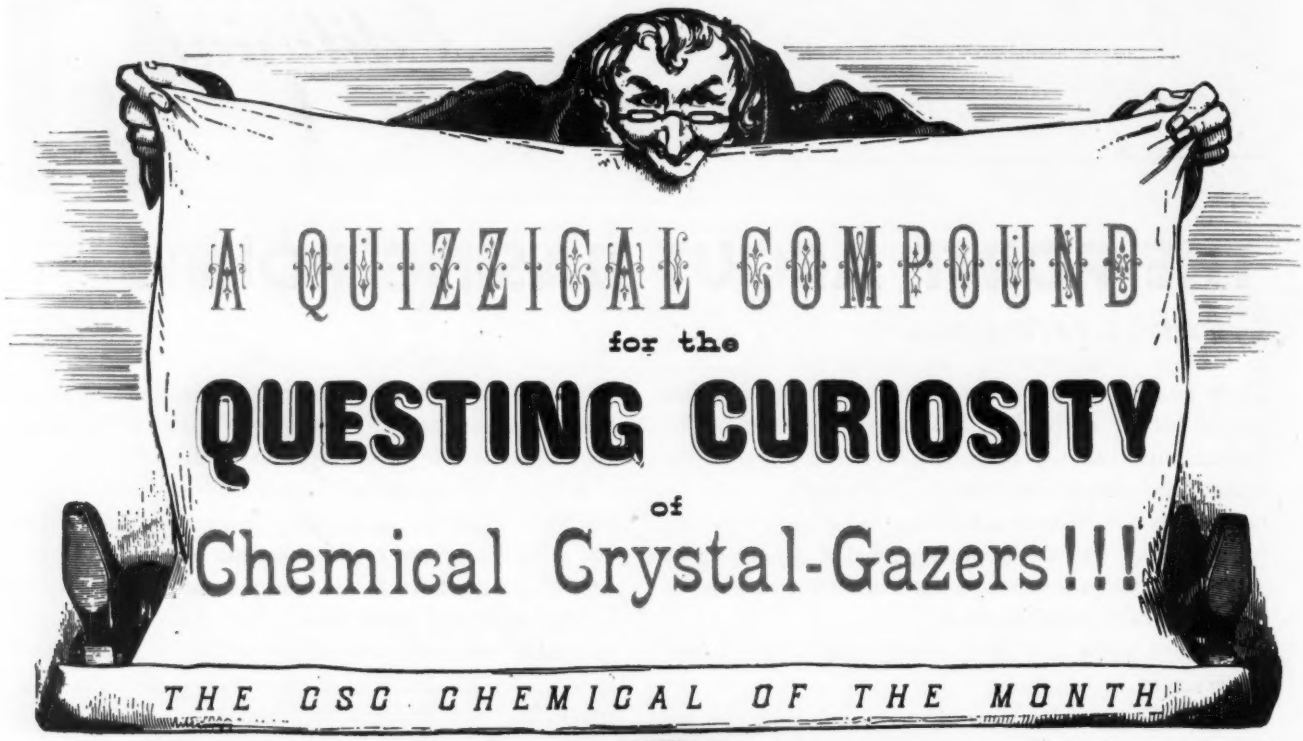
"Some parts had to come from America, and for these $50,000 were required. These dollars were applied for on June 4, 1947. In August, the application was turned down on two grounds; first, the Ministry of Supply held that the soapmaking plant of the country was ample for its requirements; and, secondly, the Ministry of Food could not give their blessing because they were not satisfied an equally economical plant could be obtained in England. . . .

"I finally got my dollars on the grounds that we must increase our engineering exports, and it would be a good idea to have this plant as a show plant.

"The plant to-day is in the Liverpool warehouse, paid for, incurring storage and insurance charges, and depreciating, simply because the Ministry of Food tell the several other Government departments that they cannot recommend the use of 45 tons of steel to put up a building to take the plant—saving of coal is apparently unimportant.

"When I bought this plant, so far as I know, there was no other commercial plant in existence; at least I could not get any information about one even in America, and this is the first plant of its kind bought for the British Empire. A Dutchman and an Indian have already been over to see it working, but it is still packed in cases lying in a warehouse."

CSC MAMMOTH CHEMICAL CIRCUS



A QUIZZICAL COMPOUND

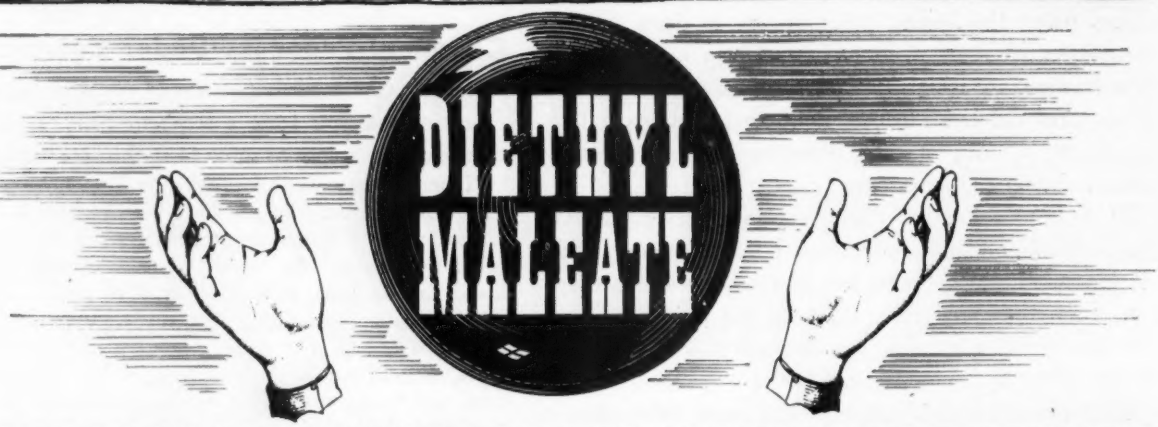
for the

QUESTING CURIOSITY

of

Chemical Crystal-Gazers!!!

THE CSC CHEMICAL OF THE MONTH



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What new fields of chemical investigation are opened by this compound—an ester as well as an unsaturated solution, undergoing reactions typical of both chemical groupings?

Can you use this material in the manufacture of:

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TENTATIVE SPECIFICATIONS:

Purity: 99-100%
ester as Diethyl Maleate

Specific Gravity
at 25°C/25°C: 1.065-1.066

Boiling Range at 40 mm of Mercury: Not less than 90% distilling in a three degree range including 129°C

Melting Point: -10° to -12°C

Acidity as Maleic Acid: 0.015% by weight maximum

Water: 0.5% by weight maximum

Color: Water-white

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What's new

CHEMICALS RIDE THE WAVES

Chemical companies eye tankers for shipment of bulk chemicals as Celanese's formaldehyde service shows the way.

THE SIGHT of tankcars hauling chemicals to and from plants located near cheap water transportation has long disturbed chemical traffic managers. But there has been little they could do about it. Barges have been used for some chemicals on inland waterways, but the ideal vessels for a great number of liquid products—ocean-going tankers—have had many deterrents to their development, not the least being problems having to do with size.

Now, however, organic chemicals are being produced and shipped in volumes sufficient to justify large-scale storage facilities at strategic terminals, and a number of companies—particularly those on the Gulf Coast—are eyeing the advantages tankers have to offer: cheaper transportation and closer control of materials in transit. Vanguarding what may prove to be a trend, Celanese Corp. of America last month inaugurated regular tanker shipments of bulk formaldehyde from Texas to New Haven, Conn.

Man Named Jones

Fittingly enough, a man whose name was on the tongue of everyone in New Haven when he coached football at Yale twenty years ago has had a significant role in this latest development. Since severing his professional connections with the boola-boola crowd, Tad Jones (through T.A.D. Jones & Co.) has concerned himself with supplying New England with commodities more important than football victories, though diehard old Elis may disagree. On his trips to haul oil from Texas, he could see chemicals pouring from plants in volumes that reminded him of petroleum itself. He approached Celanese, at the time anxious to find a better means than tankcars to ship formaldehyde from its Bishop plant to the heavy consuming Eastern seaboard. Excello Corp., a Jones subsidiary, bought a surplus LST, converted the ramp to an orthodox bow, and with Celanese's technical knowledge of formaldehyde, built the first ocean-going tanker for that commodity.

To handle the corrosive 37 per cent formaldehyde, seven separate tanks of 70,000-gallon capacity were fashioned of ¼" solid stainless plate. These are all enclosed in an insulated envelope heated by recirculating hot air. All pumps, valves, and fittings are stainless steel, while pipelines are of aluminum or stainless. The load can be split in any fashion to handle inhibited (7% methanol) or uninhibited (2% methanol) formaldehyde.

Although transportation by water represents a saving over rail, considerations of quality were probably more important to Celanese in launching the new venture. In making shipments by tankcar, formaldehyde was generally loaded in Texas at 130° F. It was hoped that the insulation would keep the material at a high enough temperature to prevent excessive paraformaldehyde formation, but the many changes of weather met in the two-weeks trip often made this impossible. Moreover, loading at the higher temperature promoted corrosion, and iron-contaminated formaldehyde is anathema to users who like it colorless.

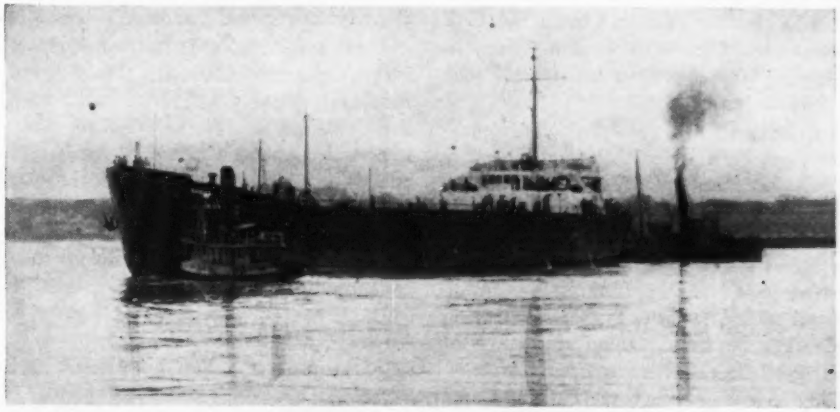
A Constant Record

Under the new system, an optimum temperature can be maintained from plant to consumer. Formaldehyde is hauled the sixty miles from the plant at Bishop to storage at Corpus Christi by tankcars. There resin-lined steel tanks (one each of five- and ten-thousand-barrel capacity) are kept at the proper temperature by circulating the formaldehyde itself through heat exchangers. Aboard ship the automatic system keeps the temperature at 95-100° F. At New Haven there is one 5,000-gal. resin-lined steel tank, one of similar construction holding 10,000 gallons, and one 10,000-gal. aluminum tank, all temperature-controlled. A constant record of temperature and routine analyses testifies to the quality of the product, or the lab at New Haven sends it back to Bishop for reprocessing. The tanker, making the round-trip in about 20 days, is expected to haul 50-60 million pounds per year.

Delivery to consuming plants will be by a fleet of insulated aluminum tank trucks of 3,600-gallon capacity. These will service New England, and the Middle Atlantic states as far south as Philadelphia and Wilmington. Celanese feels that formaldehyde that can be ordered by telephone will give it a tremendous advantage in this area. In the swing to a buyer's market, a product of assured quality should command attention too.

Caustic in Tankers

This most recent interest in tanker shipments recalls that it has been tried for other chemicals in the past. Mathieson operated a small tanker to carry liquid caustic from Lake Charles to Norfolk from 1939 until it was sunk by enemy action during the war. Its center tanks were lined on the sides and bottom with nickel, and were heated by a small steam boiler. Another one operated by the same company was a combination tanker and



CELANESE FORMALDEHYDE: Tankers aweigh!

dry cargo vessel that hauled a substitute for salt cake for a short time. However, it was given up because it was too small.

Some years ago Diamond Alkali Co. operated a motor vessel that carried liquid caustic from a Great Lakes port to Fredericksburg, Va., on the Rappahannock River. This vessel was equipped with insulated tanks which kept the caustic soda warm enough to permit unloading after a trip of a week to ten days without the use of steam heating coils at the destination.

The route of travel was via Lake Erie, the Welland Canal and Lake Ontario to Oswego, N. Y., where it entered the New York State Barge Canal. The vessel traveled through the canal to Albany, thence down the Hudson River and the Atlantic Ocean to Chesapeake Bay.

The vessel was powered by two 350 HP diesel engines, each driving its own propeller. Cargo capacity was 250,000 gallons, or about 1,400 tons.

Believed to be the granddaddy of the movement is the Wyandotte tanker that has been in operation since 1935 carrying caustic soda from the Great Lakes to the Atlantic seaboard. In the last two years, a subsidiary, the Michigan-Atlantic Corp., has operated the vessel. Its 250-300,000-gallon steel tanks have occasionally been lined for certain materials. In addition to caustic, it has hauled coconut oil, syrup, and concentrated sulfuric acid.

Oil companies for a number of years have transported part cargoes of liquid caustic in one or more of the compartments of their oil tankers and are still doing it to some degree. The present tight supply of the material is not conducive to a revival of the tanker movement for caustic, but companies may go into it again when it is more available.

Organics a Good Bet

A different situation holds for many organic chemicals: tremendous production of materials requiring good control in special containers during long hauls makes tankers an attractive possibility. It is known that one company is hauling acetone and other chemicals from the Gulf Coast, and Carbide & Carbon Chemicals Corp. is studying the advantages of such shipments.

Celanese is in a good position to capitalize further on water shipping. The construction of its tanker enables it to carry any one of the company's other chemicals (acetic acid or acetone, for example) either as a split load or in another similar tanker that may be forthcoming. Additional storage facilities farther south along the Atlantic could extend the range of its truck fleet. There is even the possibility of a trip through the Panama Canal to supply the plywood industry of the Northwest with formaldehyde for its resin glues. Close temperature control of formaldehyde in stainless tanks may eventually mean shipment of the 50 percent material, and a trend away from the wasteful inhibited formaldehyde, the methanol of which goes up the flue of the resin plant. Celanese's long-term contract with Excello for operation of its tanker will probably mean exploration of some of these possibilities.

FLUOROPLASTICS

First Teflon, now Kel-F. Others may come along to swell the ranks.

DISCOVERY of a moldable "noble" plastic has been the goal of chemists and engineers since Du Pont initiated Teflon production in 1943. Attainment of that goal was made known recently by M. W. Kellogg Co., which is now producing Kel-F, a polymer of trifluorochloroethylene*, in limited commercial quantities. Kellogg's technical men worked with W. T. Miller, of Cornell University, to develop it. Dr. Miller was a pioneer in the reactions of the monomer.

W. T. MILLER: Chlorine makes it moldable.

Other companies deep in fluorine chemistry—Columbia Chemical Division of Pittsburgh Plate Glass, Penn Salt, Harshaw, Minnesota Mining, General Electric, and General Chemical Division of Allied—have nothing to report in the way of fluorine plastics; but Hooker Electrochemical Co. admits that its research department has done some work on fluorine-containing polymeric oils and greases.

Now There Are Two

So at present Teflon and Kel-F have the field to themselves. Both were developed during the war for a military project in which they still presumably are being used, each in the applications for which it is best suited. They have entrenched themselves in many applications where extreme resistance to corrosion overbalances the high cost per pound. Among such applications are packings for valves and other rotating equipment, gaskets, and the like.

Like Teflon, Kel-F is a high-cost corrosion-resistant plastic for special uses where cost is a secondary factor. Both materials are resistant to chemical attack by strong acids (including hydrofluoric), caustic, fuming nitric acid, and aqua regia. They are also similar with regard to electrical properties—both are excellent insulators—and also in that they are fabricated without the use of plasticizers.

Chief difference between the two is moldability. Kel-F can be molded (compression, transfer, injection) by conventional techniques at 550°-600° F.; Teflon is machined, but field evaluation of molding is now under way. They also differ in color: Teflon is transparent in thin sections, waxy-white or gray in larger pieces; Kel-F is glass-clear. The useful temperature range of the former plastic is —75° C. to 250° C.; of the latter, —196° C. to 200° C.

* Fluorothene is another name that has been used for trifluorochloroethylene polymers.

PAINT TEST SPEED-UP

Device permits prediction of panel and Weatherometer test results in 48 hours.

THERE'S often more to a painted steel panel than meets the eye. Sometimes the paint film looks perfectly coherent—perfect protection against weathering and corrosion—but unseen porosity may prove to be its undoing.

Dr. Max Kronstein, of New York University's College of Engineering, needed a quick evaluation test for a paint research project sponsored by the U. S. Signal Corps. Outdoor "panel farms," Weatherometer tests, salt-fog exposure and other normal procedures were satisfactory, but they took too long for rapid screening.

Catching Ions

He remembered a principle described in the Czechoslovakian literature and adapted it to research use. The electrographic print method, as he calls it, utilizes a small laboratory press, two aluminum sheets, photographic-grade paper, blotting paper, and a radio battery. The painted steel panel is placed on one of the aluminum electrodes and covered with a sheet of paper. Blotting paper soaked in a solution of potassium nitrate provides

conductivity to the other aluminum electrode, which is placed on top. The whole assembly is then put under pressure and an electrical potential from a radio battery applied for ten seconds. If there is any flaw in the coating, iron ions will be liberated from the panel and be deposited on the photographic paper. Development of the paper with potassium ferri-ferrocyanide will give a "blueprint" of the flaws, revealing their size, shape, and degree of porosity.

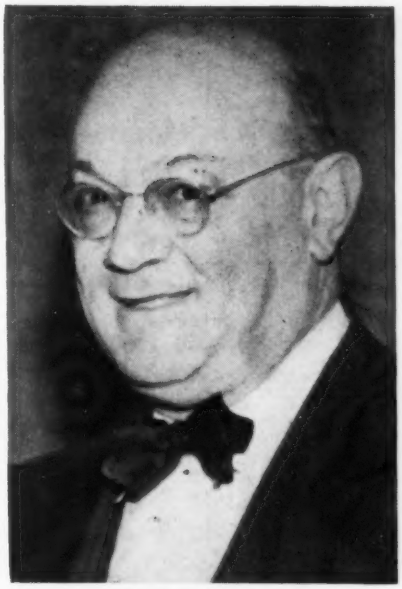
The test can reveal breakdowns of films in salt fog or in the Weatherometer long before such failures are visible to the naked eye. A set of electrographic prints, together with a 48-hour salt-fog exposure and a repeated set of prints, gives concrete data for evaluating and comparing paint modifications and treatments.

Mechanical Breakdown

The new method also reveals the amount of damage caused by abrasion or other mechanical punishment of paint films. In one test electrodes were bent to fit a panel after it had been turned around a conical mandrel in one of the standard test procedures. Electrographic prints revealed the minute cracks in the film caused by stretching the coating film. In other tests the coating was purposely cut with a razor blade, and the prints revealed the spreading of moisture under the film from the damaged area.

The test method is not limited to steel panels. Any base metal can be used provided it gives a detectable reaction on the paper. Prints of painted cadmium surfaces, for example, can be developed by hydrogen sulfide to give a yellow print; and if the base metal is copper-containing, sulfide gives a black print. The method is highly adaptable, in fact, to give meaningful results under a wide variety of experimental conditions.

MAX KRONSTEIN: Flaws leave footprints.



B. R. ARMOUR: Add baking powder . . .

A. E. MARSHALL: . . . stir gently.

RUMFORD TO HEYDEN

The Rhode Island baking powder and phosphates manufacturer is latest to join the far-flung Heyden group.

IN ITS 94 years of New England existance Rumford Chemical Works had carved out a name and reputation for itself in baking powder that was the envy of better-heeled competitors. But to Rumford's chemical engineer president, Albert E. Marshall, baking powder didn't look like the jet fuel required to propel the company through another four score years and ten. He wanted to expand the chemical end of the business.

Last month Rumford directors and stockholders found the means to carry out their president's recommendation. They accepted, subject to the waiting period required by Rhode Island law, the offer of Heyden Chemical Corp. to purchase all of the assets of Rumford Chemical Works for 99,438 shares of Heyden common stock and assumption of Rumford's outstanding liabilities. Heyden common is currently selling at about $24 a share.

Phosphate Foundation

In Rumford, Barney Armour's fast-growing Heyden organization will acquire a going business in phosphate chemicals (Rumford's annual sales: $5,000,000, including baking powder) which will further round out its already diversified line of organics, pharmaceuticals and heavy chemicals. It will also acquire a direct sales outlet to the grocery field, one of the few connected with a chemical company.

Rumford, on the other hand, will gain what its family owners could not provide: needed capital for modernization and expansion. There will also be access to the larger and more modern research and engineering facilities of Heyden. The merger will not, according to President Marshall, mean any change in the Rumford name, policies or personnel.

The Rumford plant and headquarters are located at Rumford, R. I., near Providence, and employ 331 people. With the construction of additional facilities, Rumford expects—among other things not yet disclosed—to process semi-finished Heyden products for sale in the New England area. Present Heyden plants are at Garfield, Fords, and Princeton, N. J., Detroit, Mich., and Memphis, Tenn. Last year Heyden acquired the Nyal Company, distributor of over-the-counter drug items. It owns C. E. Jamieson & Co., Detroit, and American Plastics Corp. and has a substantial interest in American Potash & Chemical Corp.

PLASTIC ANNEALING

An advantage often cited for plastics over glass—in tableware, for example—is that they don't break upon sudden heating or chilling. But strains are sometimes present in injection-molded polystyrene that develop into cracks upon use. These strains can be traced by dipping the article in a naphtha solvent, which causes surface cracks to appear along the strain lines in a few minutes.

Now Monsanto scientists, using this "tracer" technique, have developed a tempering process. The die temperature is raised slightly during molding and the finished article is bathed in water at 80°-88° C. for 5 to 15 minutes immediately after molding.

SCHNYDER AND FLEXER: The mercury stays put.

ELECTRIC VITAMIN

Hoffman-LaRoche, Inc., has adapted electrolytic reduction to commercial preparation of a riboflavin intermediate.

THE HUGE DEMAND for riboflavin (vitamin B_2) as an enriching agent for bread led Hoffmann-LaRoche, Inc., to look about for a convenient method of synthesizing it. They believed that synthesis offered potential advantages over the current fermentation method.

The hard nut to crack was *d*-ribose, the sugar portion of the molecule. The most readily available intermediate was *d*-ribonolactone, which could be prepared fairly readily from glucose; but conversion of that to *d*-ribose required selective reduction by nascent hydrogen from sodium amalgam in aqueous acid solution. Thousands of pounds a day of the amalgam would be required for production of riboflavin on the scale contemplated. First of all, preparation of the amalgam by non-electrolytic means is not simple, and secondly, handling of large quantities of mercury presents a health hazard.

Electrolysis to the Rescue

Why not prepare the amalgam by electrolysis of a sodium salt right in the reduction vessel? It was tried and it worked. Hydrogen has such an overvoltage that it is possible to "plate out" sodium directly and form an amalgam at the mercury cathode.

A small, 80-ampere cell was built for experimental purposes. The layer of mercury at the bottom of the cell was connected to the source of power by a graphite rod extending through the top of the cell. Two platinum anodes were enclosed in porous ceramic cups containing sulfuric acid. The cell was filled with dilute sodium sulfate, and pre-electrolysis yielded a paste-like amalgam. The pH was adjusted to 3-4 by addition of sulfuric acid and *d*-ribonolactone was added. Electrolysis was continued and the yield of *d*-ribose was very good.

Then the investigators, L. A. Flexser and W. A. Schnyder, discovered a peculiar thing: When the mercury was fresh, yields were good; but as the mercury was used over and over, the amount of product fell off. It was finally learned that the culprit which was poisoning the mercury was ammonium amalgam, and that the amount of the poisoning agent was proportional to the contamination of mercury with iron. Apparently the iron catalyzed reduction of atmospheric nitrogen to ammonia. Further experiments proved that iron and heavy metals must be rigidly excluded.

Bigger and Bigger

After the 80-amp. cell had been properly tamed, the investigators went on to build a 300-amp cell, and later, a 1,000-amp. unit. Now another problem reared up: removal of the tremendous quantities of heat liberated by the reaction. It was not possible to cool the cell itself, for there wasn't room enough for proper heat transfer. The cell liquid was therefore circulated by a glass pump to a brine-cooled heat exchanger so that the temperature of the liquid would not rise above the optimum 15° C. The 1,000-amp. cell strained the capacity of an 8-ton ice machine.

About this time the War Assets Administration had some bargains in 2,000-amp. generators, so Hoffmann-LaRoche decided to standardize on that size of cell. The new unit has nine platinum (no other material would do) anodes in porous compartments, and the mercury cathode receives its power directly through the stainless-steel shell. Above the mercury level the shell is lined with rubber. The cell liquid is pumped through four jets whence it flows outward, between the mercury surface and the anode compartments, and overflows into a reservoir and is pumped to a Freon-cooled heat exchanger. The piping is all of Saran. Control of pH, by acid addition, is automatic.

Other Possibilities

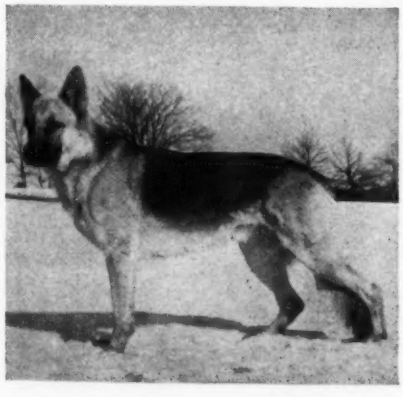
It it quite likely that the fundamental process will find further application. The new cell, Dr. Flexser says, can be adapted to other reactions requiring the same general conditions; and many such reactions—the reduction of nitric acid to hydroxylamine is one example—can be culled from electrochemical researches. There's no telling which one may next become prominent, but the equipment and "know-how" to do the job are already at hand.

FLEADOM AT STAKE

Chlordane dog shampoos now offer liquid flea control in a small package.

NOT ALL OF the nation's 17 million dogs have been able to take advantage of Ridz, the chlordane dog rinse introduced about a year ago (CI, December, 1947, p. 976). That 40% chlordane emulsifiable concentrate has been available in bulk, mainly to veterinarians, while "the other half" of the dog population (whose owners do their own defleaing) has had to scratch for itself when conventional powders failed to find all the nesting places in a dog's coat.

Now even these underprivileged hounds



DOG: In debt to chlordane.

may enjoy the benefits offered by the new control method, for chlordane shampoos are appearing on retail counters under a variety of trade names. In general these have the same sales appeal: washing and defleaing can be accomplished at the same time; the liquid gives more complete penetration than powder, especially with long-haired animals; and about two week's residual protection against reinfestation by fleas and ticks is claimed.

Chlordane content of these emulsions varies from 0.5% to 2.0%, and the price is about a dollar for a sixteen-ounce bottle. Among those being sold are Pet Shampoo (Elmonte Manufacturing Co.), Southland Tictoc Lotion (Southland Products Co.), Dog Clean Shampoo (Excelsior Exterminating Co.), and Sunday Shower (House of Huston). Elmonte also markets a 5% chlordane Pet Dip, while E. S. Holmes Co. of Hollywood, Cal., apparently feels that the dog owner still wants a powder since it has incorporated chlordane into its flea powder formula.

Cats also have their troubles with fleas, but their habit of licking themselves has made manufacturers wary of including them in label directions. There is some hope that they too may safely enjoy this protection. Recently investigators at Texas A. & M. College dipped several in 0.42% chlordane solutions without ill effects.

Mange Control

In addition to these small-package items, interest has continued in the bulk dip field. Fort Dodge Laboratories of Fort Dodge, Iowa, has recently introduced Engo, a product similar to Boyle-Midway's Ridz, and other 40% chlordane solutions are being sold for the same purpose. With this increasing flood of materials to remake a dog's life have come reports that the mite causing sarcoptic and demodectic mange is vulnerable to such treatment. Common and red mange in dogs have been eliminated by dipping in a 0.25% chlordane solution for 30 to 60 seconds.

Of even greater economic significance is the effectiveness of chlordane dips on hogs suffering from sarcoptic mange. One application of a 0.25% solution has been sufficient to kill the damaging mites.

SHORTAGE?

JUNE chemical engineering graduates from the Illinois Institute of Technology still led the entire engineering field with average starting salaries of $282.90, but that figure is a considerable drop from the $302.02 of the February group. The whole engineering group registered a slight drop to $264.72 from the $265.25 obtained by the February graduating class.

MOLDABLE ALKYD

High heat resistance, rapid molding feature first commercial alkyd molding compound.

LONG AN ingredient of hard-wearing automobile paints, alkyd resins became available for the first time in moldable form last month with the announcement by the Plaskon Division of Libbey-Owens-Ford Glass Co. of Plaskon alkyd molding compound. The material which is thermosetting is a phthalic-type alkyd which contains diallyl phthalate and an asbestos filler. It is characterized by high electric arc resistance, high heat resistance, and an unusually rapid molding cycle. It is priced at 45 to 50 cents a pound.

Why Not Sooner?

Two obstacles have stood in the way of commercial development of an alkyd molding compound during the 25 or 30 years that alkyds have been registering their phenomenal rise in protective coatings. One of these was the problem of controlling the extremely rapid curing reaction that takes place spontaneously when the resin is brought to curing temperature of about 300° F. The other was stability.

Both of these problems have been licked in the new Plaskon material. In fact the rapid curing, through the addition of a control ingredient to the compound, has been turned into an asset in that it makes possible faster molding than is obtainable with other thermosetting materials. A piece the size and thickness of a poker chip, for example, requires but 5 to 10 seconds in the mold. The curing reaction then continues to completion of its own accord over the next 12 to 24 hours. The rapid molding cycle plus the low molding pressures required (500 to 900 psi as compared with a ton or more for other thermosetting materials) may result in cheaper, lighter-weight and faster molding presses, Plaskon engineers believe. They point out, however, that the alkyd compound can be molded in most conventional presses. What may be a prototype of the new presses is contained in the accompanying illustration, which shows an experimental machine designed by Plaskon.

Unique Properties

Arc resistance of Plaskon alkyd is claimed to be about 35% greater than that of any other commercial plastic. Also claimed for it are high heat resistance (withstands temperatures to 350° F.), unusually high dimensional stability under large temperature changes, and less shrinkage than any other plastic. It is resistant to all common organic solvents and to strong and weak acids.

First applications of the new compound are in electrical connectors, switch units, and some classified military items. A number of these are now in limited commercial production.

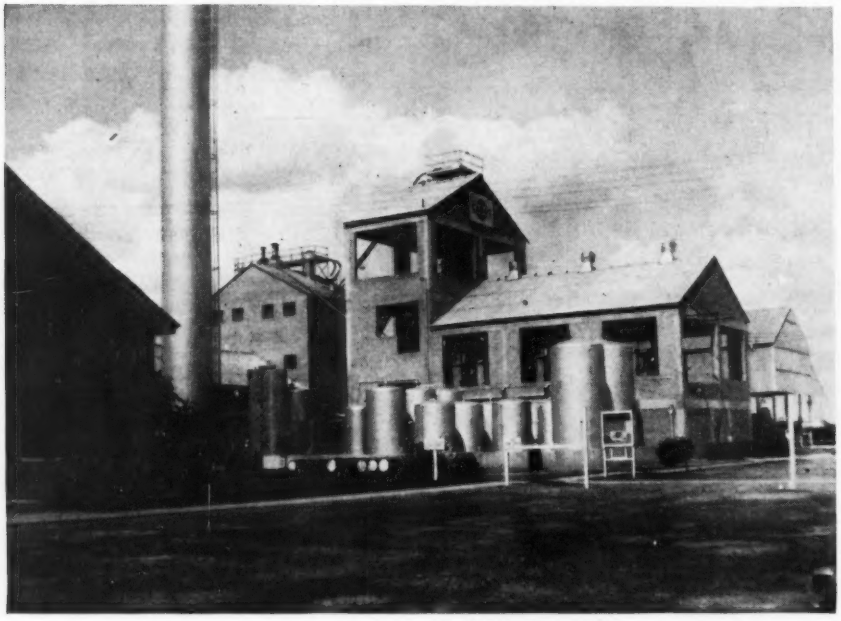
A small production unit for Plaskon alkyd began operation in April in the company's new $10,000,000 Toledo Plant. In the thinking of Plaskon general manager W. W. Knight, Jr., however, this was hardly a beginning. Alkyd molding compound, he prophesied, "may be the forerunner of a whole new line of Plaskon products."

ALKYD MOLDER: Faster and lighter.

INDOIL CHEMICAL

The line of demarcation between petroleum companies and chemical concerns took another beating a few weeks ago, when Standard Oil Co. (Indiana) set up a wholly-owned subsidiary, Indoil Chemical Co., to handle sales and other activities of Standard's chemical products department. This action recalls similar undertakings by Standard Oil Co. of California (Oronite Chemical), and Phillips Petroleum Co. (Phillips Chemical).

Officers of the new corporation include W. B. Plummer, president, and R. C. Gunness, vice-president. H. R. Peterson is sales manager. Plummer and Peterson were manager and sales manager, respectively, of the chemical products department; and Gunness will continue in his capacity as Standard's research manager.



VALLEY VITAMINS: Industrial chromatography comes of age.

GREEN LIGHT FOR CHLOROPHYLL

Extraction of leaves and fractionation of the extract is big business. Products include chlorophyll, xanthophyll, carotene and phytol.

FOR CENTURIES the greenness of chlorophyll has delighted the eye by its very existence in every growing plant. Today this widespread color is being used to abet the sales of soap and cosmetic materials; it is an important ingredient in Airkem, Inc.'s Air-wick deodorant and it has been reported to be efficacious in such pharmaceutical preparations as those for the promotion of the healing of open wounds and burns, and for the treatment of mouth and throat disorders.

Xanthophyll and carotene are produced as co-products with the chlorophyll. Xanthophyll provides the desirable yellow pigmentation and live skin color in poultry and at the same time, by its mere presence in poultry rations, is responsible for the yellow color we demand in our morning "sunny-side-ups."

Vitamin A activity provides the major selling point for carotene. It is used as a direct additive to livestock and human foodstuffs, and in pharmaceutical preparations. Its strong yellow coloration is also generating an increasing demand as a yellow pigmenting material for foodstuffs.

There are now three producers of chlorophyll; American Chlorophyll, Inc. at Lake Worth, Fla.; the Midwest Extraction Co. at Rockford, Ill.; and Valley Vitamins, Inc., a subsidiary of Godfrey L. Cabot, Inc., at Hidalgo, Texas. Midwest and American Chlorophyll utilize solvent extraction processes while Valley Vitamins has made a significant application of the principles of chromatography on an industrial scale.

American Chlorophyll

Chlorophyll was first made commercially in the United States in 1933 at the plant of American Chlorophyll, Inc., Washington, D. C. Following a flood and fire in 1936, a new plant was installed on Virginia-Carolina Chemical Co.'s site at nearby Alexandria, Va. This plant was operated until January, 1948, when it was dismantled and moved to Lake Worth, Fla. It is now being rebuilt there under the direction of company president, Robert H. Van Sant.

American Chlorophyll's process can utilize any green leafy material that is available in quantity, such as alfalfa or ramie leaf meal. It consists of a solvent extraction and fractionation procedure developed from laboratory work conducted by the Bureau of Chemistry and Soils of the United States Department of Agriculture. Certain phases of the Bureau's work on chlorophyll were reported in 1938 (*Ind. Eng. Chem.*, p. 1073, Sept., 1938). In this report, which covered work carried forward from that of Willstatter and Stoll, it is stated that a green leafy material is extracted with petroleum ether to separate the carotene, followed by a concentration of the various carotene extracts. Acetone serves as the solvent for the chlorophyll and xanthophyll. These are separated by dissolving the acetone extract in petroleum ether. A water wash removes the major portion of the acetone, and addition of 85% methanol causes the separation of the xanthophyll. Chlorophyll is separated from the resultant alchohol-washed petroleum ether solution by a careful water wash. Complete removal of the acetone causes the precipitation of the chlorophyll from the petroleum ether solution. Chlorophyll is separated from the petroleum ether by centrifugation.

American Chlorophyll also produces phytol, which can be used for the preparation of vitamins E and K_2, in addition to the aforementioned chlorophyll, xanthophyll and carotene.

Valley Vitamins

Beginning in 1941, the laboratories of Godfrey L. Cabot, Inc., at Wickett, Texas, began work to determine what profits might be made by application of adsorption techniques (CI, p. 625, Oct., 1947) to the recovery of valuable materials from food products. Prime movers in this work were John Wertheim, in direct charge of experimentation; H. L. Titus, director of the Food Technology Division of Cabot during the development; and, as consultants, Professors John C. Sluder and Francis Griffiths, the then-acting heads of the Food Technology Divisions of Massachusetts Institute of Technology and Massachusetts State College, respectively.

Some of the early work was on biotin. But it happened that one of the first pieces of equipment to be delivered was a colorimeter, which permitted a rapid assay for carotene. Because of wartime difficulties with equipment deliveries, work was concentrated on the recovery of carotene for its vitamin A activity. Good results were obtained, eventually leading to a choice of alfalfa as a rich source and the Rio Grande Valley as a year-round growth area. A plant was completed in November, 1944.

At first dehydrated alfalfa meal was purchased from other growers. Later Valley Vitamins, utilizing some of Cabot's wartime research on the dehydration of foodstuffs, began to process alfalfa grown on its own land—currently 670 acres.

The alfalfa, Arizona grown Hairy Peruvian, is cut early to secure the maximum yield of pigments. At this stage it contains 70-80% moisture, which is removed by direct contact with the hot gases from a natural gas flame. This is done within less than one hour after the alfalfa is

harvested to preserve vitamin activity. The desired pigments occur in the leaves, which are separated from the pigment-poor stems by screening operation.

Industrial Chromatography

Hexane is used for the initial extraction of the pigments. The solution is then concentrated by evaporation before it reaches the heart and body of the process: the chromatographic fractionation.

A fixed bed of activated carbon, produced by another division of the Cabot organization, is the adsorptive agent. In operation the concentrated hexane extract first passes through two adsorbers in parallel where the chlorophyll and xanthophyll are adsorbed. A second adsorption unit adsorbs the carotene and a portion of the lipoids.

Xanthophyll is the first product removed from the adsorbent. It is eluted with a solution of hexane and isopropanol. Chlorophyll is then removed by elution with a solution of benzene in isopropanol. The latter solvents serve to provide a partial separation of the carotene and lipoids upon elution from the second stage adsorbers.

Midwest Extraction Co.

At about the same time that Cabot was starting its adsorption researches, three fraternity brothers at Beloit College, Robert F. Pagel, Kenneth Brace and John Hagmeier, decided to start their own business upon graduation. They settled upon chlorophyll extraction as a good possibility and formed Midwest Extraction Co. at Rockford, Ill., in 1941. Encouragement was received in this venture from the Rystan Co., the sole licensee of a number of chlorophyll use patents held by the Lakeland Foundation of Chicago.

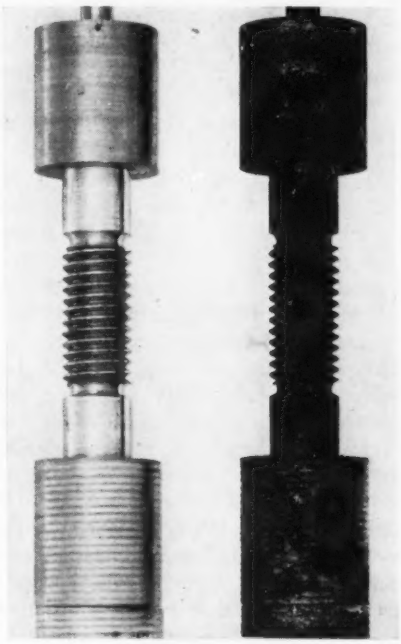
In 1945 the pace of the work was quickened by a shot in the arm in the form of new capital from the W. F. & John Barnes Co. This new capital enabled a further expansion in the plant facilities and research. At about the same time the company received all rights to the Lakeland patents.

Midwest uses alfalfa leaves as the chlorophyll source, obtaining most of its raw material from Fond du Lac, Wis. The alfalfa production from 120-140 acres is required to supply the necessary raw material. The extraction and fractionation procedures differ from those developed by the U.S.D.A. primarily in that the final removal of the chlorophyll is not by a water wash to cause its precipitation but by saponification (if the water-soluble product is desired) or by evaporation (if the oil-soluble material is to be produced). Products made by Midwest are chlorophyll, xanthophyll, carotene and phytol.

GAS ATTACK ON RUST

New synthetic chemical offers packagers unique anti-corrosion weapon.

IN THE DAYS when the woodshed was part of a lad's training, a little grease was always smeared on the axe and saw before they were put away for any length of time. Grease, or oil, is still the prime protection against rust, but silica gel and "plastic webs" have come along to do the job better and easier in some cases. Now Shell Development Co.'s synthetic chemical designated as VPI (vapor phase inhibitor) offers an entirely new approach to rust-preventive packaging: instead of keeping the moisture air out, it permeates it and renders it non-corrosive.



METAL PARTS: On the left, VPI.

VPI is a stable, white, crystalline organic salt (Shell won't say any more) developed during the war and first evaluated by the military services to solve trans-oceanic corrosion problems. It came along so late in the war that, like a lot of fellows drafted after V-J day, it didn't see much service.

It Doesn't Take Much

Not only is VPI a powerful corrosion inhibitor in water (water containing hardly more than traces of VPI will not corrode steel), but it also is slightly volatile. This combination does the trick. The material sublimes to cold surfaces and dissolves in condensed moisture to render that water non-corrosive. It does not work by pH effect since it is a neutral compound, nor does it react with or remove moisture or air. How little is required to permeate a space is shown by the fact that one gram saturates 16,000 cu. ft. of air.

It's in the Bag

The most promising method of using VPI is as an inside coating on wrapping paper or cartons. In this way it is well distributed reasonably close to all surfaces of the packaged steel article, and can saturate the enclosed space. Shell licenses the manufacture and sale of the protective paper to paper companies, two of which are now producing commercial quantities under this arrangement. Others are considering the proposition.

Because VPI is volatile, the paper is preferably coated on the outside to contain the inhibitor. A thin film of hydrocarbon wax is an efficient barrier for periods of 1-1½ years under rigorous conditions of temperature and humidity. Metal barriers can increase the time to ten years.

Although VPI has the advantages of being clean, simplifying packaging, and requiring no depreserving steps. One of its strong points is also its Achilles' heel; it's water-soluble. Since it is leached out by rain or submersion in water, the packaging material containing it has to be waterproof. Thus, deck guns will still be greased or plastic-webbed, but VPI will find other important jobs to do.

"FOOTE" POWDERS

Lithium salts of long-chain fatty acids are finding a new market in face powders.

METAL SALTS of fatty acids are not newcomers to the cosmetic field. However, lithium salts of long-chain fatty acids have only recently moved over from grease to glamor. They have long been used as constituents of lubricating greases, but, now, as ingredients of cosmetic powders, they adorn milady's face and soothe the tender derrieres of the youngest of the younger generation.

Lithalure

Lithalure is the trade mark of the Foote Mineral Co. for the mixture of lithium fatty-acid salts which it is currently offering to the cosmetic industry. Principal advantages of the materials lie in their physical characteristics. Price-wise they are still relatively high. It has an extremely low bulk density—lower than that of the currently used zinc and magnesium stearates—and no cosmetic manufacturer deplores the necessity of a "large, economy-size package." Also, it is claimed that the lithium salt has a superior oil absorbency, preventing for longer periods of time the natural oil secretions of the skin from striking through the powder coating.

These non-toxic lithium salts are cur-

LITHALURE: Grease to glamor.

rently being used in women's face powder, dusting powders, men's talcum powders, and baby powders. It is especially interesting for this latter application: Its high degree of water repellancy and oil absorbency provides a long-lasting film, preventing chafing and reducing possibilities of burns caused by prolonged contact of skin with wet diapers.

1947 WAS GOOD

Government figures show that production and sales of all synthetic organics except rubber were up last year.

PRELIMINARY figures issued by the U. S. Tariff Commission gave official confirmation to what everybody suspected: that the chemical industry last year registered substantial gains, both in output and sales, over 1946.

All categories except synthetic rubber showed higher figures, both in production and sales; and all of them except synthetic detergents showed price increases. Total sales increased 5 per cent, but sales value jumped 12.5 per cent, so the overall price increase was about 7 per cent.

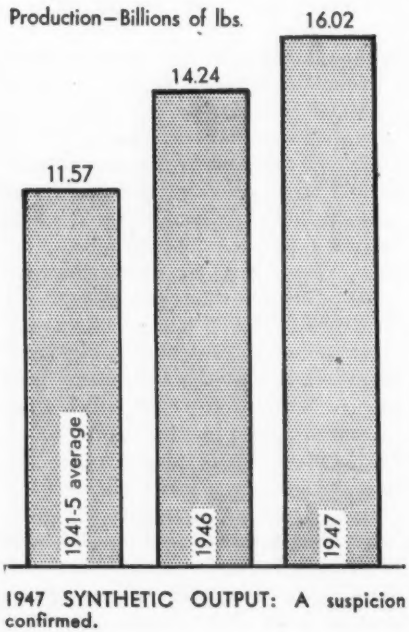
The total figures given in the report are preliminary and many of them—since they relate to successive steps in a process—include considerable duplication. But since earlier reports were made on the same basis, they are all comparable.

Details of figures

In 1947 United States production of coal-tar, water-gas tar, and oil-gas tar amounted to over one billion gallons, compared with 837 million gallons produced in 1946, an increase of 168 million gallons. This increased production of tars was paralleled by an increased output of all tar crudes except motor benzene. Owing to the continued demand for high-grade benzene, the output of motor benzene declined from 32 million gallons in 1946 to an estimated 20 million in 1947. Production of high-grade benzene, on the other hand, was 168 million gallons in 1947 compared with 136 million gallons in 1946. The output of toluene was 61 million gallons in 1947 compared with 34 million gallons in 1946; and naphthalene was 315 million pounds in 1947 compared with 242 million pounds in 1946.

Production of crude products from petroleum and natural gas for chemical conversion amounted to 3.1 billion pounds in 1947 compared with 3.5 billion pounds in 1946. Sales in 1947 amounted to 3 billion pounds, valued at 118 million dollars. The smaller production of these chemicals in 1947 reflected the diminishing demand for butadiene used in manufacturing synthetic rubber.

Total production of intermediates and finished products amounted to 16 billion pounds in 1947; sales were 10 billion pounds, valued at over 2 billion dollars. Increased output was reported generally in all groups except synthetic elastomers, production of which amounted to 1.2 billion pounds in 1947 compared with 1.9 billion pounds in 1946. For other important groups, production in 1947 was as follows: Dyes, 212 million pounds; intermediates, 2.6 billion; and plastics materials, 1.3 billion. Comparable figures for 1946 were dyes, 186 million pounds; intermediates, 2.4 billion; and plastics materials, 1 billion. Many individual chemcals were produced in considerably larger quantities during 1947 than during 1946.



1947 SYNTHETIC OUTPUT: A suspicion confirmed.

ACS MEMOS

Many papers presented at the three American Chemical Society meetings last month were of direct interest to industry.

PRESIDENT of the American Chemical Society Charles A. Thomas warned his audience that the scientist is in danger of becoming too specialized—like the dinosaur and the dodo. His convened hearers then proceeded to expose their specialization in 699 papers, many of which were of more than passing interest to the industrial segment of chemistry:

Washington

• AN IMPORTANT trend in fertilizer use, according to Thomas R. Cox, American Cyanamid Co., is the direct application of finely ground rock phosphate as a supplement to the more expensive superphosphate.

• NITROGENOUS FERTILIZERS of controlled solubility are obtained by combining urea and formaldehyde, reported R. O. E. Davis, of the U. S. D. A.

• METHOXYCHLOR, 2,2-bis (*p*-methoxyphenyl)-1,1,1-trichloroethane, is being pushed by the Du Pont Co. as an effective, non-toxic insecticide. C. J. Krister, of that company, described toxicity tests, field tests and formulations.

• THIODIGLYCOL, used during the war to make mustard gas, has been explored for peacetime uses in the laboratories of Penniman & Browne, Inc. Messrs. Crippen and Buchoff said that "sticking" agents prepared from thiodiglycol improved the adherence of insecticides and fungicides to crop plants.

• ULTRASONIC VIBRATIONS are being used at the Naval Research Laboratory to test the adherence of protective coatings to metals. The coating is smeared on a metal cap which is screwed on the end of a duraluminum cylinder attached to an electronic high-frequency sound generator. The cylinder vibrates violently and the duration of adherence gives a measure of the coating's permanence. The technique was described by Saul Moses.

• RESISTANCE of supersonic-speed aircraft surfaces to vibration and generation of heat is afforded by a "sandwich" construction of plywood, metal, or plastic laminate with a core of foam plastic, rubber, balsa wood, or a cellular honeycombed substance. Norman E. Wahl, Cornell Aeronautical Laboratory, Inc., described erosion tests of the new structural material.

• A COMBINATION of textiles and polyesters was reported by Raymond B. Seymour and others of the University of Chattanooga's Industrial Research Institute to withstand shell fragments as suc-

cessfully as armor plate. Glass fabric, Fortisan, tire-cord rayon and nylon gave the best results; and the Fortisan-plastic combination proved to be twice as strong, pound for pound, as steel.

• PLASTICIZER production, said W. A. Woodcock, Carbide & Carbon Chemicals Corp., will reach an all-time high of 200 million lbs. this year.

• TOTAL SALES of the chemical process industries, reported R. S. Aries, Polytechnic Institute of Brooklyn, reached an all-time peak of $4.5 billion in the first half of 1948—20 per cent above the corresponding period last year. The industry spent $1.5 billion on new plant last year and will spend another $1.2 billion in 1948.

• NEW MEDICAL DISCOVERIES may eventually result in large-scale production: A new pain-killing drug more potent than cocaine—an isoquinoline derivative. . . . A pyridine-derived fungicide effective in 1:150,000 concentration. . . . A more soluble riboflavin. . . . An improved method of synthesizing provitamin D from cholesterol. . . . Potent, isoquinoline-derived blood-pressure depressors. . . . Sulfonated protein blood anticoagulants.

St. Louis

• EVALUATION OF DETERGENTS is coming in for more critical attention as competition between detergent types increases. Present reflection methods of measuring soil remaining on textile samples after washing give relative results only. For this reason, according to William P. Utermohlen, Jr., of the Institute of Textile Technology, Charlottesville, Va., some laboratories are changing over to two newer methods which give fairly accurate absolute values for soil removal: determination of pigment soil in the wash water by turbidity measurements, or of pigment soil (black iron oxide) on the fabric by ashing and analysis.

• METHANOL REFINING of raw sugar has been developed on a pilot plant scale by D. F. Othmer and A. H. Luley of the Polytechnic Institute of Brooklyn. Boiling methanol is used to dissolve the impurities out of the sugar, leaving the sucrose.

• A SELF-REGENERATING ANTIOXIDANT for lube oils is something new that has been developed by G. H. Denison and P. C. Condit of the California Research Corp., Berkeley. The material is dilauryl selenide, which is claimed to be a more effective oxidation inhibitor than the commonly-used sulfides. The selenide combines with the oxygen in the oil to form lauryl selenoxide, which decomposes rapidly to regenerate 30 to 50 per cent of the original selenide. Major obstacle to commercial development: high cost of selenium.

• WATERPROOFING OF LEATHERS by a process involving polymerization in the leather of aminosilanes, a new series of organosilicon compounds, has been developed by Nicholas D. Cheronis, Synthetical Laboratories, Chicago. Five to ten per cent is sufficient to give water repellency and still permit "breathing."

• SYNTHESIS OF HYDROGEN CHLORIDE from cell chlorine and hydrogen gas by a new method was described by C. C. Brumbaugh, A. B. Tillman, and R. C. Sutter of Diamond Alkali Co. Unique thing about the process is that it delivers anhydrous gas at a pressure of 20 psi and drying is done by refrigerated condensers. The process is fully automatic and produces 99.5 per cent anhydrous hydrogen chloride.

• PONDEROSA PINE, grown only in the West, could provide the basis of a Western naval stores industry, according to Arthur B. Anderson, Western Pine Association. The stumps are about as rich in extracts as Southern pine, although the proportions of the various terpenes are different.

• DOUGLAS FIR BARK, a waste product of Pacific Northwest lumber mills, contains tannins in amounts that warrant commercial extraction, said James Hubbard and coworkers of the Oregon Forest Products Laboratory. They reported that the bark is also a potential source of cork and waxes.

• WOOD MOLASSES has proved its worth in stock and poultry feeds at the Oregon and Washington Agricultural Experiment Stations. The reports, by W. C. Weir and W. K. Ousterhout of the former, and James McGinnis and J. S. Carver of the latter, showed that pigs and chickens throve on diets containing the wood hydrolysis product.

SPEAKERS' PLATFORM AT ST. LOUIS:* Succumbing to overspecialization?

Portland

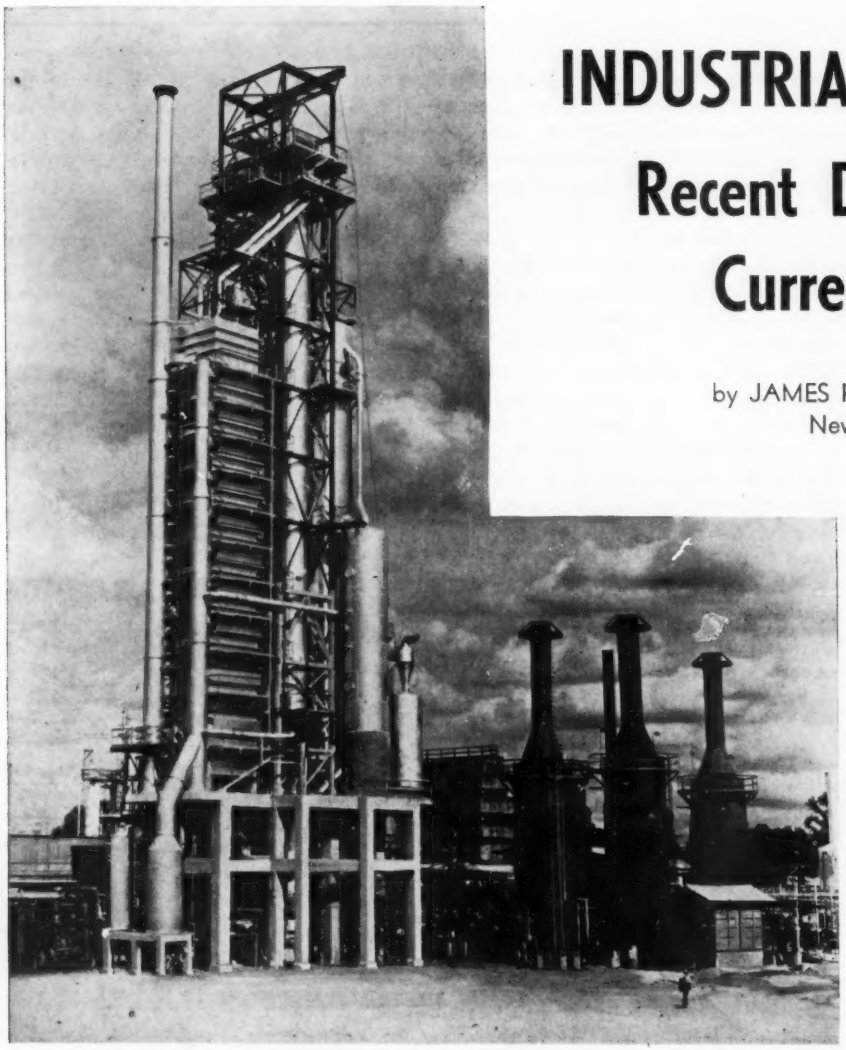
• MANY OF THE PORTLAND papers stressed utilization of characteristically-Western materials in chemical processing. One such was that of G. I. Jones and coworkers of the U. S. Fish and Wildlife Service, who pointed out that salmon eggs are an excellent potential source of cholesterol, lecithin, oil and animal protein. A solvent-extraction method of separation was worked out. The authors contend that the 5,000 tons of salmon eggs discarded annually by Alaskan fisheries could be economically utilized.

• Two OTHER government scientists, S. C. Fang and D. E. Bullis of the Oregon Agricultural Experiment Station, asserted that filbert nut growers on the West Coast are threatened by a surplus not many years hence. They advocate consideration of filbert oil, which occurs in the nut to the extent of 25-30 per cent. It is a bland oil, similar to almond or peanut oil, and could be similarly utilized.

• ANILINE-FURFURAL RESIN, used with soil in the proportion of 2 per cent, can stabilize the soil for road-building, said Hans F. Winterkorn of Princeton University. Such soils have a compressive strength of 1,200 psi, and could provide good roads for the agricultural exploitation of remote regions. Data, he said, indicate that roads made of plastic-treated soil would compare very favorably with cement highways, and could be built at low cost.

• A NEW PROCESS described by Milton Harris and colleagues of the Harris Research Laboratory is said to double the wearing qualities of wool. The process involves the use of sodium hydrosulfite to increase the number of molecular bonds, and can be applied quickly at any point of the operation from raw wool to the finished garment.

*(L. to R.) President C. A. Thomas, H. E. Wiedemann, Saul Winstein, A. H. Winheim, E. R. Weidlein, N. H. Furman, C. G. Fisher.



INDUSTRIAL CATALYSIS

Recent Developments, Current Trends

by JAMES H. BOYD, Consultant*
New York, N. Y.

THE HISTORY of industrial catalysis is parallel to, and to a considerable degree responsible for, the history of chemical progress. Catalytic cracking, "cold" synthetic rubber, and establishment of a catalyst manufacturing industry are fruits of the years since 1935. Current trends in industrial catalysis are guides to the future pattern of many chemical developments.

Left: Lion Oil Company's Thermofor catalytic cracking plant at El Dorado, Ark.

INORGANIC catalytic development began in 1868 with the development of the Deacon process for chlorine and was followed in 1875 by the contact process for sulfuric acid. In 1902 the calcium cyanamide process for the fixation of atmospheric nitrogen was developed; the oxidation of ammonia to nitric acid and the synthesis of ammonia followed in 1903 and 1908 respectively. There appear to have been no outstanding catalytic developments in the inorganic chemical industry since 1908. The original catalytic development provided an important part of the heavy chemical foundation on which chemical industry rests.

Organic chemical catalytic development began in 1882 with the conversion of methanol to formaldehyde followed in 1895 by the oxidation of naphthalene to phthalic anhydride. The hydrogenation of oils to fats was begun in 1902. Subsequent important developments have been the synthesis from acetylene of acetaldehyde as an intermediate for acetic anhydride, the preparation of hydrogen-carbon monoxide mixtures in 1913 and the syntheses of methanol in 1923 and of hydrogen cyanide in 1925. The reduction of nitrobenzene to aniline by hydrogenation was begun about 1913.

In retrospect it is now clear that these organic catalytic developments contributed heavily to the industrial growth of plastics, synthetic fibers and protective coatings; to the initial application of chemical methods to foodstuffs manufacture; and in providing the cheap aniline essential for the manufacture of rubber chemicals. This list of organic chemical developments is not all-inclusive; many of the catalytic reactions used in the fine chemical and dyestuffs fields have been omitted.

RUBBER DEVELOPMENTS

Catalytic high polymer synthesis may be said to have begun with the catalytic mass polymerization of isoprene to a rubbery mass in 1875[14] but the first industrial development had to wait until 1910 with the advent of sodium polymerization of dienes. This was followed in 1912 by the discovery of the emulsion polymerization of dienes, but synthetic rubber in the United States was not a reality until the announcement of neoprene in 1931. Plasticized polyvinyl chloride came in 1933 followed immediately by butadiene-styrene[13] and butadiene-acrylonitrile copolymers.[5] Industrial development of low-temperature solution polymerization in 1935 led to polyisobutylene and later to the butyl rubber of the war program.[4] These high polymer developments each depended on catalysis. While directed largely to the synthetic rubber field, many of the discoveries and techniques are applicable to polymers intended for plastics use.

The first clean-cut industrial application of catalysis in hydrocarbon processing was the catalytic treatment of gasoline with clay for the removal of gum-forming constituents. This was a significant economic development but possibly its greatest ultimate value lay in calling the attention of management to the industrial possibilities of catalysis in hydrocarbon processing, principally in the petroleum industry. The concept originated and spread that petroleum hydrocarbons, and particularly those of lower molecular weight, could be used as building blocks for more complex chemical structures and that catalysis was the tool to make possible the industrial realization of these ideas.

* Based on a paper presented September 25, 1948 at Fourth Annual Cleveland Symposium.

In 1933 the catalytic dehydrogenation of petroleum paraffins to olefins was a step in the realization of this dream. In 1935 the chemical industry dehydrogenated ethylbenzene to styrene and in 1936 Houdry developed catalytic cracking. The hydroforming of petroleum for toluene began in 1941 and provided a toluene supply for TNT ten times larger than the total then available from the coke ovens, previously the only source of supply. In 1943 the catalytic conversion of ethanol to butadiene and the catalytic dehydrogenation of butenes to butadiene made possible the production of synthetic rubber on a tremendous scale.[7] Later in the war, in 1944, the catalytic synthesis of diisopropyl from ethylene and isobutane made possible an even superior quality of aviation gasoline.

RECENT TRENDS

In selecting recent important developments in industrial catalysis consideration is arbitrarily limited to those occurring since 1935 which have wide economic significance. As a practical matter this confines attention to the hydrocarbon and high polymer fields though exceptions can doubtless be found to this generalization. It is convenient to discuss these developments under the headings of heterogeneous catalysis, homogeneous catalysis, and catalyzed emulsion polymerization.

HETEROGENEOUS CATALYSIS

Some of the most important developments in the hydrocarbon field have been examples of heterogeneous catalysis; i.e. the catalyst forms a phase separate from the reactants and at the interface, the catalyst surface, the chemical reaction occurs. The heterogeneous catalysts most frequently used are metals or their oxides which frequently are supported on an inert carrier.

The earliest and simplest method of conducting heterogeneous catalysis was to pass the reactants over or through a motionless mass or bed of catalyst under conditions favorable to the desired reaction. The catalyst was in a fixed bed. In theory its activity would continue undiminished. In practice the catalyst's activity gradually diminished on account of poisons, whose cumulative effect destroyed the activity of the catalyst, or because the deposition of tar or carbon on the catalyst blanketed the catalytic surface and prevented contact between the catalyst and the reactants. Sometimes physical changes occurring in the catalyst during service destroyed its activity. Or loss of activity could be due to erosion or disintegration of the catalyst with subsequent dusting and plugging of the bed. When poisoned or disintegrated, the catalyst bed is removed and replaced by a fresh catalyst mass and the chemical process resumed. But a catalyst covered with tar or carbon can usually be reactivated by burning off the organic deposit on the bed which is then returned to service and the cycle repeated. If the catalyst is cheap, it will be run to exhaustion and dumped, but if expensive it will be reactivated and reused. In some cases a discarded catalyst is processed for recovery of its metal content.

In the clay treatment of cracked gasoline in the early 1930's for removal of gum formers by catalytic polymerization, the exhausted clay catalyst was either discarded or partially reactivated by reburning in a kiln. The catalyst used in the process was then usually a mixture of burned and fresh clay. Clay treating of cracked gasoline was a relatively minor petroleum refining operation so that at best it could not command continuing major technical attention from a refiner. Catalysis was still playing second fiddle in petroleum refining.

CATALYTIC CRACKING

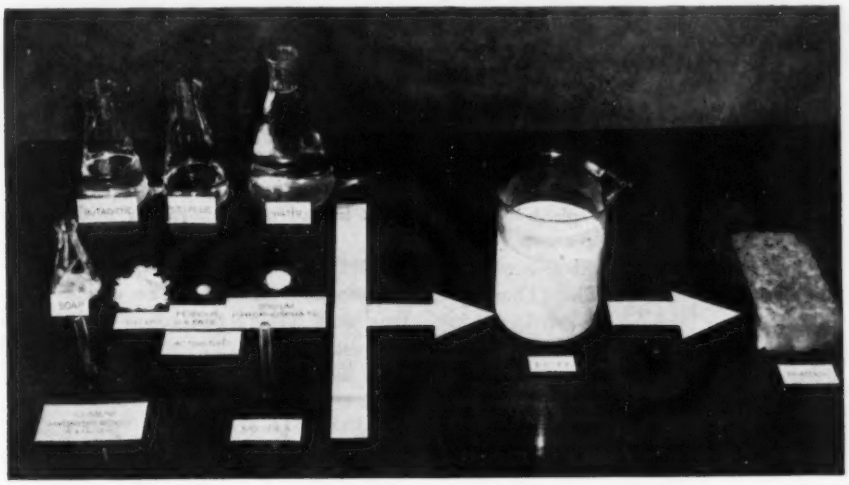
This situation changed radically in 1936 with the industrial use of the Houdry catalytic cracking process. This initially employed a bed of clay to catalyze the cracking of heavy petroleum vapors to gasoline at about 900° F.; later synthetic alumina-silica catalysts were also used.

The catalyst was in a fixed bed through which petroleum vapors were passed with resultant cracking and deposition of some coke or carbon on the catalyst. As the cracking cycle progressed the coke deposits accumulated on the catalyst and its activity diminished due to the blanketing effect of the deposit. At a suitable time the cracking cycle was terminated, the catalyst chamber or "case" was purged of oil vapor with steam, a mixture of flue gas and air admitted, and "burn-off" was carried out under conditions carefully controlled to prevent overheating and fusion of the catalyst with consequent destruction of activity. On completion of burn-off, the case was purged, oil vapor admitted, and the case was again "on stream." In practice a set of cases would be continuously on stream while another set was undergoing reactivation in order to keep the other processing equipment fully employed.

The economic justification for the Houdry process lay in higher yields and quality of motor fuel which offset the higher investment costs.

In the Houdry process the burn-off heat of combustion is removed from the catalyst mass by a fused nitrate-nitrite bath which is alternately used to supply heat to the endothermic cracking reaction in cases on stream. Excess heat from the burn-off is used for waste heat steam generation and superheating, and for preheating oil feed and burn-off air. During burn-off the cases were nonproductive and intensive study was given to the limitations imposed on the process by the use of a catalyst and its necessary reactivation. Burn-off rate is limited by the maximum temperature the catalyst can tolerate without appreciable fusion and loss of activity. On-stream productivity is limited by the rate at which heat can be supplied to the catalyst and rate of carbon laydown.

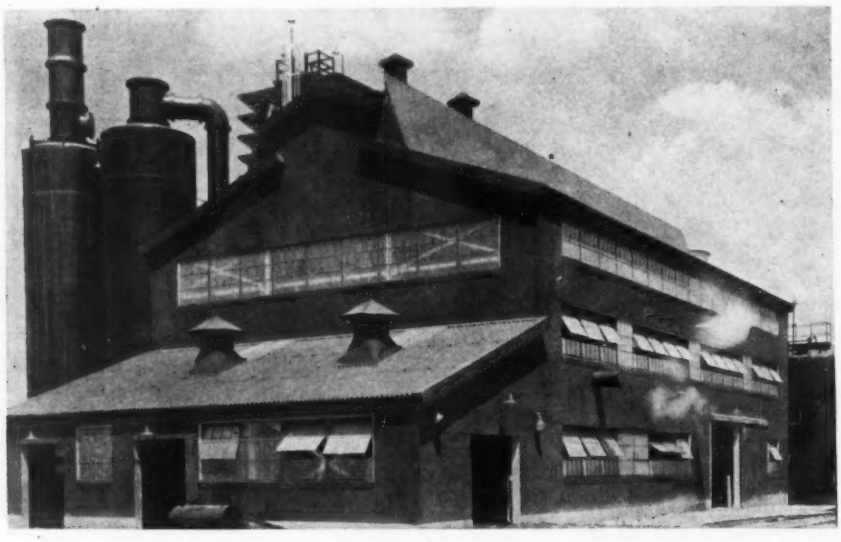
In cracking about 200 B.T.U. are absorbed per pound of gasoline formed.[8] Thus Houdry catalyst case design is necessarily a compromise to meet the diverse operating requirements of endothermic cracking and exothermic burn-off. In a fixed cataylst bed channeling and dead spots can occur. In dead areas of deficient oil vapor flow, carbon laydown is excessive due to over-cracking. During burn-off, reactivation of these areas may be incomplete due to insufficient air flow with resultant loss of activity. When channeling exists, overheating occurs and loss of catalyst activity results. These problems are typical of fixed-bed operations in processing organic materials at elevated temperatures. Despite these difficulties the worth of catalytic cracking as a process



U. S. Rubber Co. uses these proportions of materials and catalysts to make cold rubber.

and its potential application on a tremendous scale justified a corresponding scale of process research and development.

This intensive technical campaign led to continuous catalytic cracking processes with continuous feed of active catalyst to the cracking zone and continuous withdrawal of spent catalyst from it. The spent catalyst is continuously regenerated in a coke burning zone and continuously returned while still hot to the cracking unit, thus supplying a portion of the endothermic heat of cracking.



A contact sulfuric acid plant—wherein sulfur is burned and catalytically oxidized.

The Thermofor and fluid processes employ these principles. The Thermofor process uses a granular or extruded catalyst and employs mechanical elevators to lift the regenerated catalyst to the top of the cracking unit through which it flows downward by gravity. Gravity flow is also used in the Thermofor regenerator.

The fluid technique avoids the use of mechanical devices to move the catalyst through the process cycle. It employs the air-lift principle to circulate a finely divided catalyst in suspension through the cracking and regeneration vessels; generally the air used in the generator furnishes the motive power.

Catalytic cracking, particularly the fluid and Thermofor processes, had tremendous expansion during the war to increase the production of aromatic base stocks for aviation gasoline and of olefins, particularly butenes, for use in butadiene manufacture and for conversion to aviation alkylate. Catalytically cracked gasoline production in the United States now exceeds 650,000 BPD, which is about 70% of the production of thermally cracked gasoline.[1]

While catalytic cracking is a relatively expensive operation, its wider use appears certain where new cracking installations are needed because of its good gasoline yield and quality characteristics and its ability to handle high sulfur crudes which will be in increasing supply in this country and from the Middle East.

EXTENSION OF FLUID TECHNIQUE

Consideration of the fluid technique suggests its application in chemical industry. The mechanical simplicity and the ease of maintaining isothermal conditions in the reaction and regeneration zones of fluid units offers attractive savings in established fixed-bed chemical operations. Already the trend is strongly set for the extension of the fluid principle to other fixed bed catalytic operations.

Sherwin-Williams is using a fluid catalytic unit for the production of phthalic anhydride from naphthalene by oxidation with air. This reaction is strongly exothermic. The theoretical heat of reaction is 6,300 BTU per pound of naphthalene oxidized, although in this country nearer 8,800 BTU are actually evolved. The turbulence in the suspension of catalyst in the reaction unit maintains isothermal conditions in the oxidation zone.

Adapting fluid cracking catalyst reactivation practice, adequate removal of heat from the reaction zone can be obtained by continuous controlled circulation of catalyst through a waste heat boiler where the catalyst is cooled and then returned to the reaction zone.

The better temperature control improves product yields and quality. Simplified reactor design—due largely to superior heat removal—means lower investment. Both contribute to lower product costs, simpler operation, lower maintenance costs, greater safety due to explosion damping by the suspended catalyst, and superior product quality and uniformity.

Another example of the use of the fluid technique in heat removal is found in the American hydrocarbon fuel synthesis reactor wherein CO and H_2 are combined to form hydrocarbons with the evolution of large quantities of heat. The German synthetic fuel plants operated during the past war used tubular reactors with catalyst pellets packed inside the tubes which were cooled externally to remove the exothermal heat of reaction of 16,000 BTU per pound of product.[8] The heat exchange surface of these reactors formed a large part of the plant cost.

In the American development, use of the fluid catalyst principle has reduced reactor heat-exchange surface to less than 1% of the German design with a major reduction in capital cost.[12]

Great returns are potentially available from the application of the fluid technique to the catalytic oxidation of organic compounds with air or gaseous oxygen because an increase in product yield means a saving of relatively high-priced raw materials. Improved heat removal may permit the use of oxygen-enriched air with attendant simplification of recovery of product from the more concentrated reactor effluent and further lowering of investment or operating costs. The direct oxidation of ethylene to ethylene oxide, of methanol to formaldehyde, of ethanol to acetaldehyde for subsequent conversion to acetic acid, the oxidation of benzene to maleic anhydride and possibly to phenol are reactions where in the fluid technique might be profitably employed.

In the inorganic field the exothermic oxidations of SO_2 to SO_3, of NH_3 to NO_2, of the cooxidation of NH_3 and of natural gas to HCN offer possible fields of application for the fluid technique.

While exothermic reactions have been stressed above, the fluid technique also offers a means of introducing heat to an endothermic reaction under isothermal conditions by feeding an externally heating catalyst to the reaction zone while simultaneously withdrawing therefrom cooled catalyst for reheating (and possibly reactivation) and its subsequent return to the reactor. Originally purely a catalytic technique, the fluid principle is already used in such non-catalytic operations as lime burning and roasting of sulfide ores.

CATALYST MANUFACTURE

When heterogeneous catalysis first became important it was necessary for the user to make his own catalyst. For reasons of industrial secrecy this was often desirable, but as the use of catalysis increased, their manufacture by the user became regarded as a necessary burden. Meanwhile proprietary catalysts like Raney nickel began to develop. Raney nickel was made by a single group and sold to the edible oil industry for the hydrogenation of oils to fats. Thus began manufacture of heterogeneous catalysts for sale.

Many heterogeneous catalysts are metals or metallic oxides distributed on and through a support such as silica or alumina

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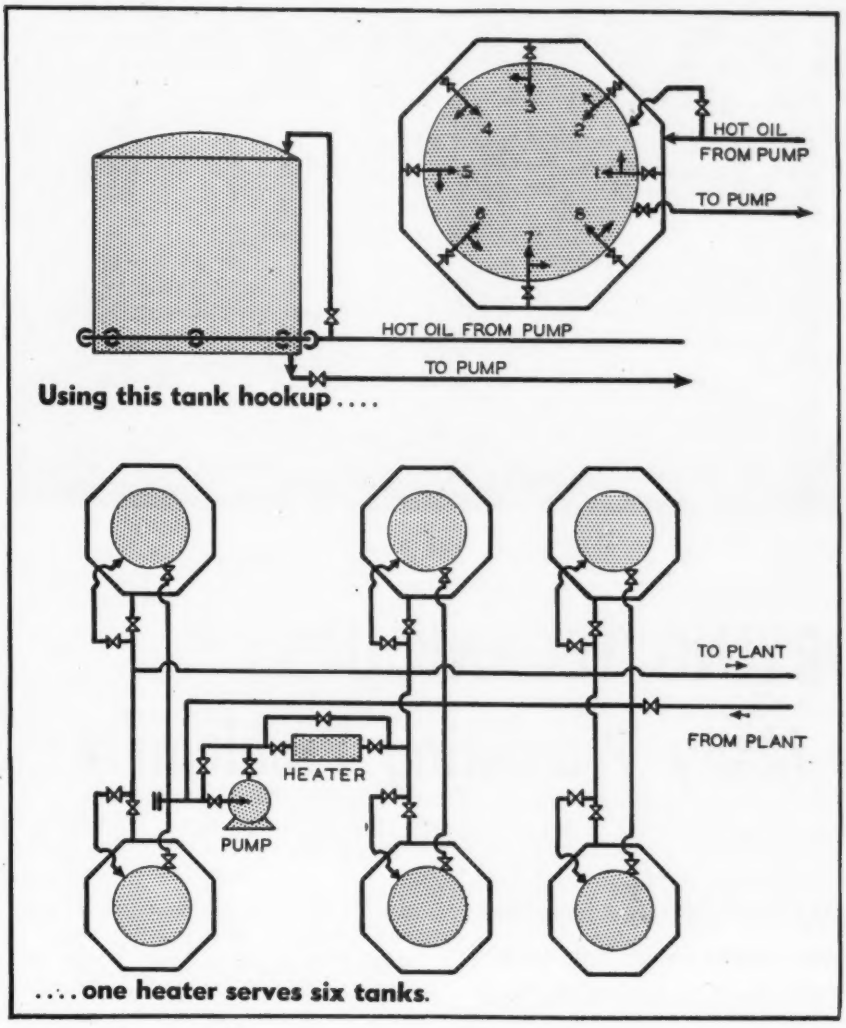


An Improved System for Heating Storage Tanks

EDITORIAL STAFF REPORT

NOVEL EXTERNAL HEATING SYSTEM for storage tank solves maintenance problems, costs less than internal heating.

THE common way of heating contents of storage tanks where necessary to render them free flowing is to provide internal steam coils or tube bundles. However, such internal heating arrangements have the disadvantage of being difficult to service. If they spring a leak they cannot be repaired except by emptying the tank. Also they are not too satisfactory for very large tanks because unless agitators are used the contents tend to stagnate around the heat exchanger, thus lowering the rate of heat transfer.

To overcome these problems in the storage of tall oil, an improved method of external heating of the tanks has been installed at the Charleston, S. C., plant of the West Virginia Pulp & Paper Co.

Crude tall oil is a mixture of fatty acids and rosin acids containing a relatively small percentage of non-acid material. The fatty acids are chiefly oleic and linoleic acids and as such are liquid at ordinary temperatures. The rosin acids, however, contain considerable abietic acid which tends to crystallize from the tall oil at such temperatures, although it remains dissolved at higher temperatures. Before the tall oil can be successfully pumped the crystals must be redissolved by heating the oil to about 150° F.

In the new system this is accomplished by pumping the tall oil through an external shell and tube heat exchanger and recirculating it to the tank until the total contents of the tank have been heated. The exchanger may be easily disconnected from the system for servicing by closing valves. Six 500,000-gal. storage tanks at Charleston are handled with this system.

The accompanying diagram shows the six storage tanks with the single pump and heater which service all of them. A plan and elevation of one of the tanks and its piping connections is also presented in more detail. Referring to the plan of this tank, the following sequence takes place in applying heat to the cold tank: First the valves connecting the tank to the pump suction are opened. The pump discharge valve is opened. Then valve 1 is opened, the heater system turned on, and the pump started. If circulation does not start, the pump rotation is reversed. This reversal is repeated until the flow of hot oil dissolves a hole in the accumulated rosin acid crystals between valve 1 and the tank discharge port. Then valve 2 is opened and heating is continued until circulation is good through this valve. Valve 1 is then closed and valve 3 opened. This is repeated around the tank until the whole tank is hot and all crystals dissolved. Care is taken to have only two nozzles open at a time. This maintains high discharge velocities and shoots hot oil to the center of the tank bottom, thus dissolving all crystals.

BYPASS PROVIDED

In addition to the nozzle entries around the base of each tank an overhead bypass to the top is provided. This is used to pump additional oil into the tank when it is not desired to heat up the tank contents and dissolve the crystals which would prevent entry through the bottom nozzles.

The use of this arrangement enables one heat exchanger to service all six tanks, thus saving the cost of an internal exchanger for each tank. At the same time no tank agitators are needed since the method of pumping provides agitation.

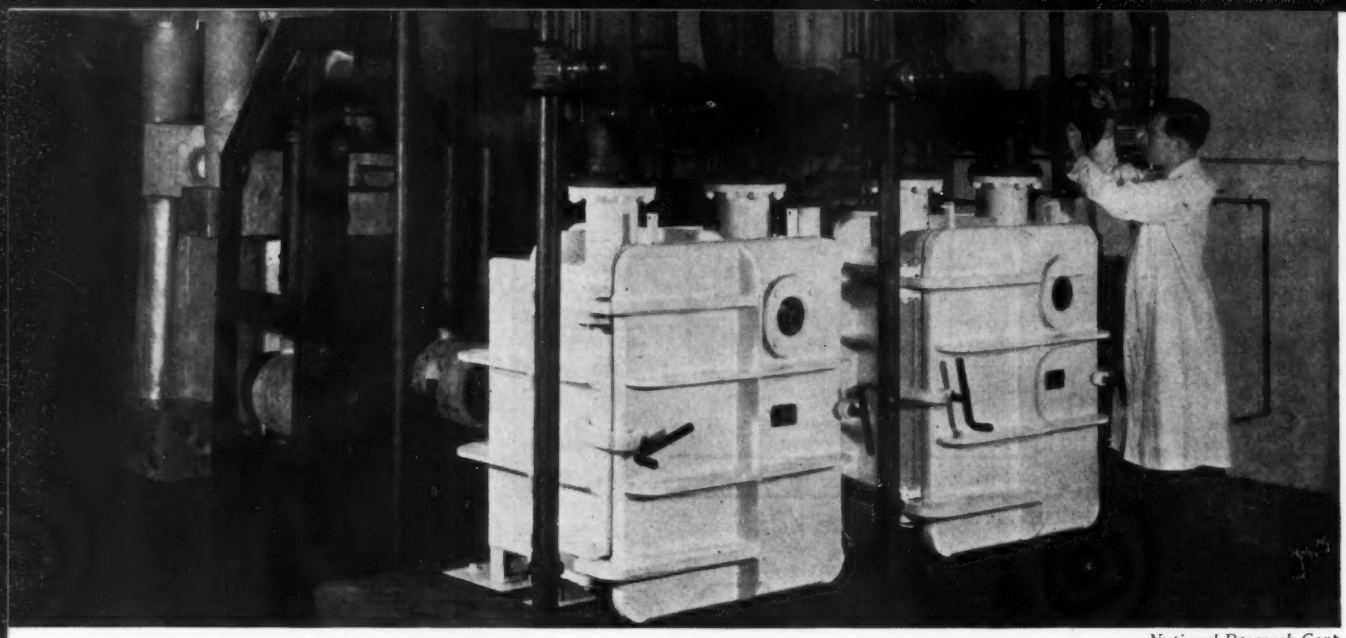
Specifications for the equipment used in the system are as follows:

Tanks—48 ft. dia. by 41 ft. high, dome tops.

Heater—1200 sq. ft. tube and shell heater. Tube sheets are fixed. Expansion is taken up by a bellows joint in the shell. Tubes are 1 in. O. D. by 20 ft. long arranged in six passes. Heat is from steam at 35 lbs. per sq. in. gage.

Pump—350 gallons per minute Viking gear pump with reduction gear drive and built-in pressure relief valve. Motor is equipped with reversing switch.

Nozzles—Nozzles are designed to distribute inlet flow shooting half towards the tank center and half around the tank wall.



National Research Corp.

Demonstration unit for high vacuum drying of blood plasma.

MODERN DRYING TECHNIQUES Solve Many Processing Problems

by KURT LADENBURG and ALEXANDER REDNISS, Technical Enterprises, Inc., New York, N. Y.

DRYING AS a unit chemical operation has registered important —if not spectacular—advances during recent years. This survey of modern methods and equipment discusses characteristics, economics, advantages and disadvantages of each.

DRYING is another operation so fundamental that its importance has not always been fully appreciated. To expell moisture from a product seems like an easy job. One doesn't have to go too far back in industrial history to find that appraisal of the problem a common one. With it flourished the home-made dryer and a few standard ready-made units. The increased number of materials produced by the chemical industry – almost all requiring a drying process somewhere along the line – has necessitated a vast variety of specialized dryers. Such needs have spurred this phase of engineering, and have been responsible for its rapid advance from the one-horse stage.

The drying operation that has become a part of practically every industrial process takes many forms. It may be humidity control of air for a laboratory or factory, for air operated instruments, for pneumatic handling of solids or for spraying of paints and similar materials. It may be the removal of large amounts of moisture to obtain a finished dried product such as powdered milk, soluble coffee, blood plasma, soap and plastics. Or it may be solvent removal from products or residues of extraction processes.

To do such jobs, drying equipment must be better today than ever before. With increased production and demand, higher labor and material costs, and keener competition, it has become vitally necessary for the drying operation for any one product to be as economical and efficient as possible. To disregard scientific and engineering considerations in the design and operation of drying equipment is no longer feasible.

The last twenty years has witnessed an ever increasing interest in fundamental studies of drying mechanism. Evidence of the continuation of this healthy situation is the amount of research work now under way to increase applications of spray-drying. There is also much activity in the development of dehydration methods for heat sensitive materials such as penicillin, plasma and flavoring materials. The number and high quality of papers on theoretical aspects of drying which are being published in the current technical journals and presented at scientific meetings justify predictions of commercial realization on such work in the near future.

In this new era for drying, the standard, ready-made unit is following the home-made dryer into the discard. Equipment manufacturers now maintain research, development, and engineering staffs to find the answers to every problem. No two drying processes are identical, since simple variants such as weather conditions alone can be of fundamental significance, and factors such as heat stability, degree of subdivision, batch or continuous operation, quantities to be handled, amount of moisture to be removed, available fuel and material of construction, determine the design of the particular dryer for the purpose intended.

The border line between a dryer and an evaporator is not too distinct. In many instances evaporation, centrifuging, pressing or filtering precedes the actual drying operation to reduce the moisture content and to decrease the time and cost of drying. However, in this paper, only developments in the design and application of dryers, as such, will be considered.

Drying itself is generally thought of as the removal of water from a solid material. Since this probably comprises better than 90% of the world's industrial and agricultural drying, the definition appears sound, but there are a considerable number of special cases and different mechanisms which should be taken into account as they are coming more and more into industrial usage.

In general, the mechanisms of drying are:

(1) *Evaporative.* To lower the vapor tension of a liquid above a solid-liquid

mixture by continuously removing the vapor formed on heating, until such vapor tension is low enough for commercial purposes. There are many special forms of evaporative drying, such as spray drying and certain distillation processes, which can be construed to follow this form although the solid phase may be absent. Evaporative drying would include about 90% or more of the commercial drying today.

(2) *Absorptive.* This mechanism has several forms. Water is removed from an immiscible liquid such as benzol by absorption by a deliquescent solid. The method is used considerably for drying air to actuate control instruments, for removing traces too small to be detected by ordinary analysis and for drying gases such as chlorine by hydration of strong sulfuric acid. In the pharmaceutical and dyestuffs industries, water from the product is absorbed by an anhydrous powder such as sodium sulfate or magnesium sulfate, thereby converting free moisture into water of crystallization and obtaining a dry end-product. Obviously this is most suitable for expensive heat-sensitive substances which can stand some dilution by solid material.

The use of lithium salt solutions and organic glycols for air or gas conditioning is still another special form of absorptive drying which is widely used.

(3) *Adsorptive.* Silica gel, activated alumina, and other adsorbents remove the water. This form of drying is used in industry for air conditioning and drying of gases. The equipment designed for this drying mechanism has progressed considerably during the war years and today presents the process engineer with a reliable tool for continuous service.

(4) *Other.* There are in addition other forms of drying, especially of air and gases. Of these the most widely used is drying of air by refrigeration until the dew point is exceeded and droplets of water are formed in the air stream. These droplets are easily separated by mechanical means and the air, on reheating to a temperature lower than the original, is less humid and cooler. This process is generally used to maintain a relative humidity in the range of 30-50%. Most air conditioning systems presently installed in theaters, homes, and banks utilize this mechanism for drying and simultaneous cooling. In the future, however, it is possible that the use of glycols will become more general especially in those instances where the concurrent sterilizing effect of glycols is desirable.

EVAPORATIVE DRYING

SPRAY DRYERS

Twenty years ago there were very few successful installations of spray dryers in the United States, although in Europe this method was used already to considerable extent. The dairy industry was the first to employ this method—for the production of dry milk powder and whey. Today spray dryers have found their way into almost every industrial drying process, including such diverse materials as plastics, foods, and biologicals. A great deal of operating data have been accumulated, enabling the equipment manufacturer to design the correct dryer for any desired performance. Testing units are maintained by several manufacturers to assist customers with new problems. Several laboratory and pilot plant spray dryers are now on the market for those customers interested in doing their own experimentation.

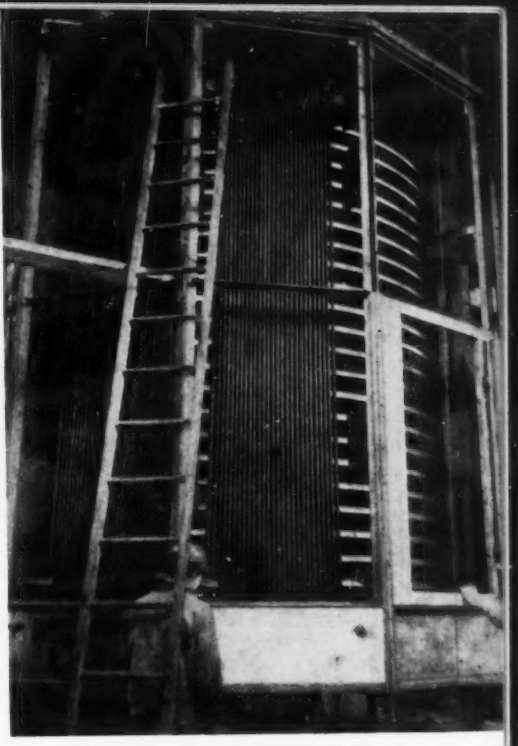
The process of spray drying consists of atomizing a solution, suspension or slurry and spraying the fine droplets into a stream of hot gas or hot air. Such atomization is produced either by forcing the solution under pressure through spray nozzles or by dispersing through centrifugal atomization. Centrifugal atomization was developed for viscous solutions and slurries which would clog the small orifices of spray nozzles. For this purpose a spinner, a disc or a wheel is mounted on a vertical shaft at the top of the spray chamber and the slurry flows by gravity onto this dispenser rotating at high speed. Various designs are used to produce fairly uniform particle size in the spray.

The hot air stream blown into the spray chamber transmits its heat to the individual particles of spray, evaporating the moisture and leaving behind the solid in powder form. This is then collected either in the bottom of the spray chamber or in a cyclone or dust collector placed in the exhaust air passage. Evaporation of the moisture prevents overheating of the product and, by varying conditions, the physical characteristics of the end-product can be changed considerably.

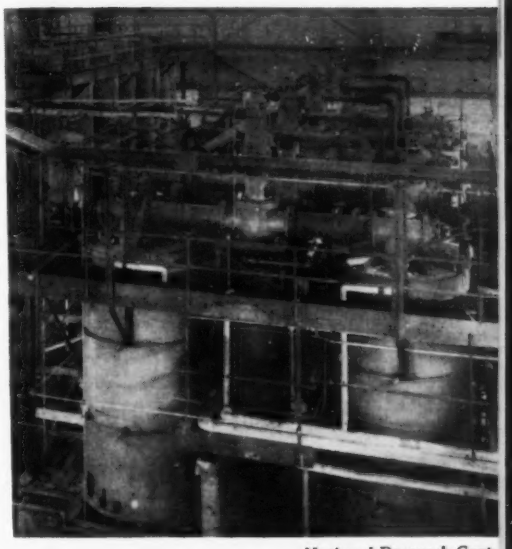
In cases where the solid product has a low melting point, it has been found feasible to provide an outer manifold through which cold air is introduced. In this way the solid particles may be cooled immediately after evaporation of the moisture while they are still suspended in the air stream.

Air for the drying operation may be heated in any desired way — steam coils, electric heaters, direct gas flame, etc. Naturally, the heat loss in spray drying is appreciable since the exhaust air still carries off considerable heat. With the exception of preheating the liquid to be sprayed or preheating the fresh drying air, it is not practical to utilize the residual heat in the exhaust air.

Use of flue gases which are being wasted in many factories however, would offer greater economies. The major importance of spray drying is the particular physical characteristics of the finished

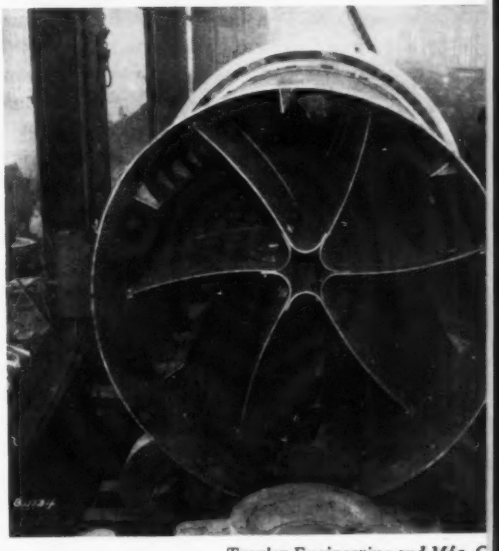


Wyssmont Turbo-Dryer.



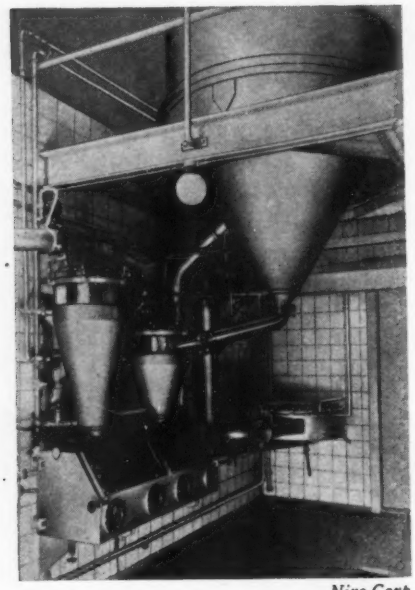
National Research Corp.

Diaphragm section of a 9' by 60' rotary dryer.



Traylor Engineering and Mfg. C

Vacuum drying 50,000 gals. of orange juice per day.



Niro Corp.

Sterile spray drying of blood plasma.

product. Particles are generally round in shape, either hollow or spongy—an ideal condition if a highly soluble product is desired. Good uniformity of size, shape, and density may be obtained and a wide range of particle sizes is possible. In addition, spray drying provides direct conversion from a solution or slurry to the final dry material, suitable for packaging without further processing, in an unusually short time interval—30 to 60 seconds for the individual particle.

A number of commercial processes employ similar equipment for a slightly different purpose—to remove small amounts of moisture or solvent from a product which is solid at room temperature. A good illustration is D.D.T. The hot liquid from the final wash is sprayed into a stream of cooler air which evaporates the residual moisture and leaves a dry, granular, porous product behind.

A very interesting development in the spray-drying field has taken place in Europe. During the last war, a Danish company, in conjunction with the Danish Serum Institute, designed and built a spray drier which operates under completely sterile conditions. This was accomplished by adapting a regular dryer to allow the entire system to be sterilized and kept sterile during operation. The discharge from the cyclones is enclosed in a sterile cabinet equipped with hand holes so that the product can be packaged without contact with outside air. The drying air of course, is also sterilized and put through a special filter. The whole system is operated under a slight positive pressure to prevent inward leakage of non-sterile air.

The entire demand of Denmark and of Sweden for dry blood plasma was supplied by this process which can also be applied to the drying of penicillin, streptomycin and other parenteral materials. A similar unit was put into operation in Sweden and both dryers have operated very satisfactorily for long periods of time. However, in the U. S. only the much more costly method of freeze-drying has been and still is used for drying parenteral products. Although the sterile spray-dryer is now also available in this country, this development is being overlooked by the American pharmaceutical industry. The performance of the spray dryer as far as the form of final product is concerned is unique. This alone justifies the continually increasing interest in this method.

VACUUM SHELF DRYERS

There are many products produced in small quantity which are injured by normal drying temperatures, are sensitive to oxidation, or are hygroscopic and difficult to dry. Despite their high initial cost, small unit capacity and high operating cost, vacuum shelf dryers are generally used for materials of this nature.

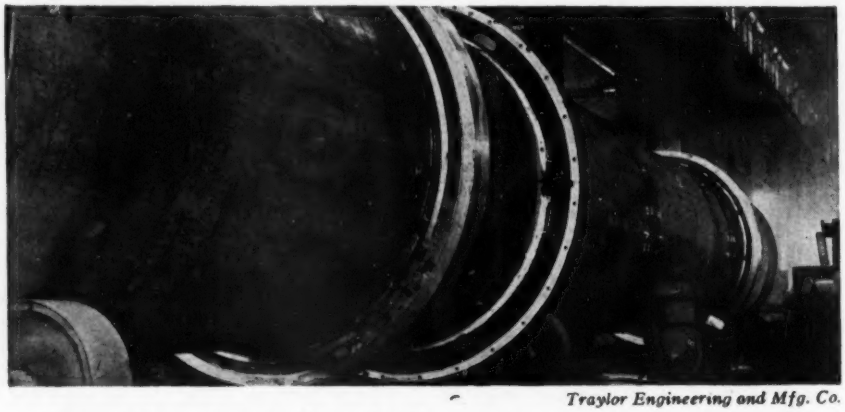
This type of dryer is very much like the cabinet dryer except that here the cabinet is made of dense cast iron or plate steel to enable it to withstand a full vacuum. Heating is accomplished by hollow trays through which a fluid heat transfer medium (hot water, steam, propylene glycol and others) flows. The material to be dried is placed either directly in trays or in individual bottles that are also set in suitable trays. These are placed on the heated shelf. The cabinet is evacuated to remove continuously the water vapor over the solid. A fairly large condenser, vacuum pump, instruments, steam ejector, and vacuum receivers are necessary auxiliary equipment which contribute to its high initial cost. Depending on the water release characteristics of the final solid, the drying cycle runs from 4 to 24 hours, but is generally in the lower range.

It is obvious that generally only valuable and heat-sensitive products such as certain pharmaceuticals can be dried in this type of equipment. In these cases, operating expense and first cost considerations become secondary factors.

In the last two years considerable progress has been made in high vacuum drying techniques, with and without the vacuum shelf dryer. Such diverse materials as fruit juices, soups, soluble coffee and vegetables have been the object of reseach to preserve as nearly as possible the flavor of the original material by this means. High vacuum adaptations of a moving belt dryer and drum dryers have been used and soon will make their appearance in commercial processes. These are competitive, their high cost of operation notwithstanding.

During the war, high vacuum sublimation drying of penicillin and plasma came into prominence. This method sublimates water vapor from the frozen product in a vacuum shelf dryer and produces a dry product with a minimum of decomposition. The removal of water vapor at these high vacuums presents a very difficult problem because tremendous volumes must be evacuated. This has been solved (1) by condensation of water in the form of ice on a cold surface of a static trap or a scraping condenser at a temperature in the range of −50° C; (2) by evacuation or pumping through the use of steam ejectors, both condensing and non-condensing types; and (3) by absorption with solid and liquid absorbents. The cost of removing this water vapor from the system, however, is quite high, and still presents much of a problem, not only in the economics of operation, but in the difficulties of technique.

Operation of the high vacuum sublimation process begins with the freezing of the product. If a container holds a small amount it may simply be placed in a cold bath or cold room. With large volumes, however, it has been found more advantageous to freeze the material in the form of a shell around the inner wall of the container, since drying time is a direct function of the thickness of the frozen material. Shell freezing may be accomplished by spinning the bottle or container at high speed in a low temperature atmosphere. This distributes the solution evenly over the entire inner wall of the container by centrifugal action. There it is quickly frozen. During desiccation, the



Traylor Engineering and Mfg. Co.

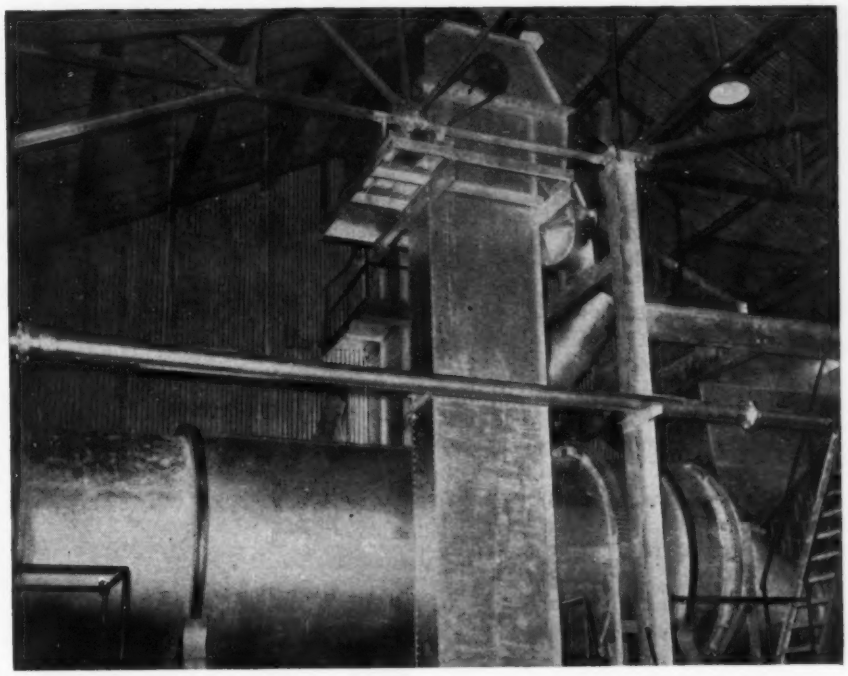
Rotary indirect dryer for drying 90-100 metric tons of cement rock per hour.

material must be kept in the frozen state but, naturally, the latent heat of sublimation must be supplied. As drying proceeds, partial melting or softening may occur well below the freezing point of water and some products, such as plasma, must be kept quite cold to avoid the deleterious effect of softening. At the same time, the faster the heat can be supplied below the softening point the faster the drying can proceed. For this purpose, the shelves and walls of the vacuum chamber dryers are hollow to permit circulation of the cooling or heating medium from a tank maintained at the proper temperature. Media such as water, brine, ethylene glycol, propylene glycol and others are used depending on the characteristics of the product to be dried. With a high efficiency in the removal of water vapors it is even possible to use steam to supply the latent heat of vaporization without raising the temperature of the material above the melting point. Employing electric sources of heat affords greater accuracy in controlling the heat supply and also makes possible rapid temperature adjustment. Infra-red lamps and high frequency fields have also been used very successfully.

In removing water vapor at high vacuum, direct-pumping steam ejectors eliminate the necessity of low-temperature condensation of vapor. However, steam rates and cost become excessive in large installations at very low pressures. Appropriate oil pumps have been designed to operate without the benefit of low temperature condensers, water being continuously removed from the oil by means of an auxiliary centrifuge and special evaporator.

The third method of water vapor removal is the use of solid desiccants or liquid absorbents. Among the solids employed are silica gel, activated alumina and anhydrite. Liquid absorbents recently have been applied to vacuum dehydration, and aqueous solutions with a vapor pressure as low as 2 to 3 mm. are available. By taking advantage of the vapor pressure lowering over water when a non-volatile substance is dissolved, the surface of such an absorbing liquid may substitute for a condenser. Among the substances forming strongly hygroscopic solutions in water now used in vacuum drying are the lithium halides, calcium chloride, sulfuric and phosphoric acid, and diethylenetriamine. For continuous operation the liquid is removed from the system, heated, concentrated by boiling off some of the water, cooled and returned to the absorber. While such systems as yet have seen application only in relatively small installations, experimental data clearly indicate that large units are practical.

Vacuum drying without freezing the product has advanced too. High vacuum technique has been developed to such a point that large scale industrial installations are possible. One such plant, processing more than 60,000 gallons of fruit juice per day has been described in the literature.



Link-Belt Roto-Louvre granulator for producing a very dry free flowing sugar.

By necessity, development of accessory equipment such as valves, vacuum gauges, controls, and pumps has kept pace with progress in drying techniques. Special valves are required at pressures below 1 mm. because of leakage problems. So called packless valves are commonly employed where the moving stem is encased in a flexible bellows. Rotating shafts have been introduced into vacuum systems by using flexible bellows or rotary seals or by installing the driving motor within the closed system. The portable, tilt-type McLeod gauges measures pressures between 10 and 10^{-6} mm. Improved leak detection equipment, too, has been of prime importance. The ionization gauge, the alphatron and the mass spectrometer have proved themselves good tools for this purpose. In addition to the conventional oil pumps, four and five stage steam jets have been designed so that pressures of 50 microns in commercial use are becoming more frequent daily. Large diffusion pumps also are to be found in big industrial installations.

CABINET DRYERS

Cabinet dryers consist essentially of an insulated rectangular box equipped with a large door and a series of shelves or shelf racks, suitably spaced one above the other in horizontal planes. The material to be dried is placed into suitable trays, in a fairly thin layer (generally about 1" thick). The trays are placed in the dryer and door closed. The source of heat may be external or internal and may be supplied by steam coils, electrical resistance strips, flue gases, or any other convenient device. Circulation in the cabinet may be by blower or natural convection, which causes heated air or flue gas to pass over and under the trays, heating the solids and at the same time sweeping the evolved water vapors out of the dryer. Usually to conserve heat, some of the exhausted air is recirculated. This type of dryer functions at substantially atmospheric pressure and the heating is done by conduction through the trays or by convection from the hot gaseous atmosphere. The temperature to which the solids are heated can be controlled simply and inexpensively by dampers controlling the ratio of exhaust to circulated air, or thermostatic elements to control the city gas impact flow or the steam to the coils, but there is much gradation of heat intensity at various points of the cabinet.

In general, although cabinet dryers are relatively wasteful of heat and labor, their initial cost is small and the temperature is easily controlled. Most materials stable in air, produced in fairly small amounts (a ton or under per day), and sensitive to heating over 100° C. are handled in such equipment.

Since there is relatively little dusting inside the cabinet, and since the trays are easily loaded, unloaded, and cleaned either manually or with mechanical assistance, it is not difficult to understand their popularity in the chemical industry. This dryer is essentially a batch process machine, with exceptionally wide use for a limited number of drying conditions. Various adaptations have extended its principles of operation to semi-continuous or continuous operation of which the truck dryer, tunnel dryer and moving belt dryers are the most common types.

The truck dryer is a large cabinet

dryer. Trays are loaded mechanically to a definite layer thickness and then set in place by hand or rack trucks. When the rack trucks are loaded, they are pushed into the dryer, which may hold almost any number of them. The trucks may stand in the heated atmosphere of the dryer from 4 hours to 3 days until dry, without danger of overheating or contamination. If the dryer cabinet is long enough, trucks can be loaded as desired from one end and unloaded at the other in a fairly continuous manner. This type of design is generally called a tunnel dryer.

A moving belt of cloth or wire, however, may be substituted for the trucks. The absence of trays, the shorter drying cycle permitted by very thin layers of wet material, minimum labor cost, good heat efficiency coupled with ability to handle large volumes of material in carefully controlled conditions, and fairly low initial cost per pound of water evaporated per hour, have made this dryer very popular. Another adaptation is a multiple belt arrangement: wet material is fed at the top onto the uppermost belt and discharged into a hopper passing through the floor. Where large evaporative capacity is required in a minimum of floor space, and where the material has reasonably good water releasing characteristics, this dryer does yeoman service.

ROTARY VACUUM DRYERS

Rotary vacuum drying is a batch operation that finds application in a variety of chemical drying processes. It is often employed to recover valuable solvents from extracted materials or to dry heat- and air-sensitive products.

This dryer consists of a stationary steam-jacketed cylinder in horizontal position with an internal spiral or paddle agitator mounted on a shaft which runs through the center of the cylinder and is driven by motor and gear reducer from the outside. The best type of agitator has been found to be a double spiral which tends to move the material evenly back and forth through the dryer and provides a rapid discharge as soon as the bottom outlet of the dryer is opened. The shaft of the agitator may be hollow to allow heating. A dust filter or dust collector is usually located between the dryer and the condenser to keep dust out of the vacuum equipment. The vacuum may be generated by a mechanical pump or a steam jet. In case of the latter, the exhaust steam may be used to heat the jacket of the dryer. In some cases, where lower temperature is desired, hot water is used for heating. The design of the separator, condenser, and receiver and the capacity of the vacuum source depend entirely on the size of the dryer itself, the material to be dried, the amount and characteristics of the vapor to be removed.

The advantages of the rotary vacuum dryer are the ability to handle sizable batches of material at a small labor cost; the safe drying of heat-sensitive or easily oxidized materials; fast and uniform drying that frequently eliminates a final grinding or milling operation; and the recovery of valuable volatile solvents.

The disadvantages include the fairly high initial cost due to required auxiliary equipment, inconvenience in cleaning when it is to be used for a different product, and maintenance cost in keeping smallest possible clearances between scraper and walls.

There is available little information and practically no data which would allow a competent engineer to estimate accurately equipment sizes, drying time, evaporation rates and other characteristics for a new material to be handled. Only actual tests in the final equipment will give the desired information. No great advances have been made in the field of rotary vacuum drying. Recent developments have concerned themselves mainly with improving agitation, reducing power and heat requirements, and improving the drying rates.

Research spray dryer

ROTARY KILN DRYERS

A rotary dryer is a rotating cylinder, usually slightly inclined, through which the product to be dried moves continuously. Hot air or hot gas is passed either parallel or counter-currently through the cylinder to evaporate the moisture. The cylinder itself may be heated but losses in heat-transfer reduce efficiency. Materials best handled by a rotary dryer are granular, semi-dry products which can be conveyed easily and which do not stick to the walls of the dryer.

The performance of a rotary dryer for each material also depends on the proper choice of rotating speed, pitch of the dryer, diameter, rate of feed and permissible temperature. These factors must be studied and properly adjusted if a uniformly dry end-product is to be obtained.

The Roto-Louvre dryer, developed in Europe and introduced into the United States about 10 years ago, is designed to provide more intimate contact between hot air and charge. In this type, overlapping louvre plates are attached to the inside of the cylinder wall, thus forming channels through which the hot air enters and passes through the bed of material into the drum. By means of a special inlet casting, hot air is admitted only to the part of the louvre in direct contact with the material.

This dryer allows a shorter drying period than the conventional rotary dryer and consequently, for the same capacity a smaller Roto-Louvre can be used.

The Roto-Louvre as well as the rotary dryer can be employed in continuous as well as batch processes. Both types are used principally to remove residual moisture from semi-dry material such as would be obtained from a centrifuge or filter.

Although the rotary dryer is widely used, this type of drying operation lacks reliable and complete basic operating data. As a result, new developments have been very limited. There has been evidence that fundamental studies of those drying operations are being made. Only when the results have been evaluated can further advances in kiln dryers be expected.

DRUM DRYERS

Drum dryers are commonly used when solutions, slurries or pastes are to be dried in a single step and the final product exhibits good stability to heat. Large quantities can be handled continuously or in batch operations, as desired.

Various designs of drum dryer construction are identified as Single-Drum, Twin-Drum and Double-Drum. They may be operated at atmospheric pressure or under vacuum, and a considerable variety of feed systems such as dip feeding, spray or splash feeding and gravity top feeding are feasible.

Basically, the process of drum drying is drying material on the surface of an internally heated drum which rotates slowly in a horizontal position, carrying a thin film of the liquid to be dried. As the water evaporates, the film gradually changes from liquid to solid state and the product is flaked off continuously by a knife edge.

Such equipment was first used in the paper and textile industry more than 100 years ago and it has since been adapted to the chemical industry for the drying of those products for which a thin flake form is desirable, such as soaps, detergents, cereals, milk, animal feeds, glue, etc. In the single-drum type, the simplest method of feeding a liquid material is to pump it into a pan into which the lower end of the drum dips. A spreader roll is used to produce a uniform, thin layer. An alternative method is to splash or spray

the liquid against the drum, thereby obtaining better control of film thickness. A second drum may be installed on the same framework, dipping into the same pan. This is the twin-drum type which simply duplicates the work of two single drums in a single piece of equipment. In a double-drum dryer, two drums are set close together and rotate in opposite directions. The liquid is fed into the upper trough formed by the two drums. By regulating the clearance between the drums, a film of uniform thickness is obtained. In this operation all of the liquid is dried and nothing remains at the end of the run.

By placing the entire equipment into a heavy vacuum shell and providing the necessary accessories for constant feed, continuous removal of the dried product, condensation of moisture, removal of dust and generation of vacuum, the entire operation may be carried out at reduced pressure and, consequently, lower temperature. Naturally, the initial cost of such installation is considerable because of the heavy construction of the equipment, vacuum seals, and other accessories. In addition, the equipment is extremely heavy and rather cumbersome and costly to operate. Especially because of the high initial cost per unit evaporator, drum drying in vacuum is not used very frequently.

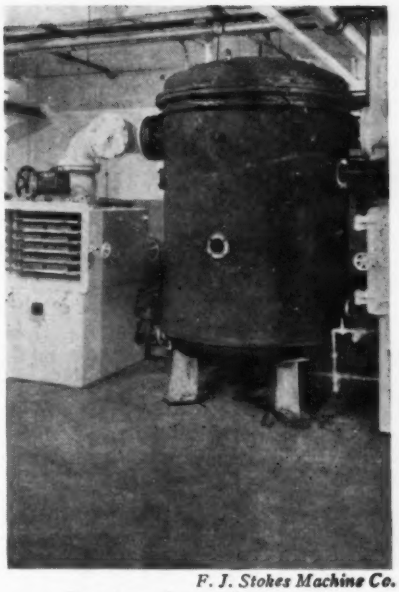
In recent years some improvements have been made to reduce the weight of construction and allow automatic operation to lower labor costs, but there have been no basically new developments in the construction of drum dryers.

TURBO DRYERS

The Turbo Dryer is similar in basic design to a Hereshoff Furnace. Whereas the Hereshoff Furnace has been extensively used for drying at high temperatures, the Turbo Dryer, developed fairly recently, operates at lower temperatures and consequently the materials of construction can be transite, metal, or any combination of materials to fit specific applications.

This dryer consists of rotating circular trays, one above the other, activated by a central shaft. Stationary rabble arms move the material to be dried alternately to the center and to the perimeter downward from tray to tray. Fans are located on a vertical axis in the center blowing hot air concurrently or counter-currently, as desired, each rotating tray acting as a baffle so that there is a full even sweep across each tray. Generally, dust collectors are not required as the wet feed at the top traps the dust carried in the air stream. This type of dryer is well suited to handle large quantities of material with good heat economy at controlled low temperatures for pastes and slurries.

This type of operation exposes a new surface to the drying air at each shelf transfer, giving relatively short drying time and preventing overheating to considerable extent. The dryer can be designed to handle economically almost any daily capacity with a minimum amount of labor. An example of the flexibility of this type is shown by its suitability for sublimation of materials such as naphthalene by reversing the process.



F. J. Stokes Machine Co.
Tray-type freeze drying unit.

ABSORPTIVE AND ADSORPTIVE DRYING

Since absorptive and adsorptive drying are rather new, a discussion of developments includes the methods as well as the equipment. For the last thirty years, the term sorption has been used to cover all occlusion and adsorption phenomena. This solves the problem of designating correctly systems where the difference between absorption and adsorption is not clear cut, such as the case of activated carbon where an initial rapid adsorption of gas on the surface is followed by a slower absorption of gas in the interior of the carbon particle.

One of the simplest methods of removing small quantities of water from an immiscible liquid or solution is to add a drying agent such as sodium sulfate, calcium chloride, active charcoal, silica gel, or alumina, mixing it until equilibrium has been obtained, and removing the solid. The equipment required for batch processes would be a tank with an agitator and a filter. For continuous operation, the wet solution may be pumped through a series of towers packed with the drying agent. When the first tower becomes saturated, it is removed from operation, the drying medium regenerated or replaced, and the tower is placed back onto the train at the end of the line.

A similar design can be used for the removal of moisture from gas or air. Here, instead of towers, several sections of beds can be employed either in series or in parallel. The operation is made continuous by definite cycles controlled by motor-operated rotating valves. In one cycle the wet gas gives up its moisture to the drying agent and is cooled ready for use; in the other cycle the bed is reactivated by direct heating or by passing a stream of hot gas through it. These units are able to operate continuously month after month. The automatically operated mechanism is so constructed that the supply of dry gas is available at all times.

In another design, the drying agent is carried in a cylindrical basket made up of two concentric cylinders of wire mesh screen. This "basket" or "drum" rotates slowly through two compartments which are separated by an air seal. The section of the drum in one compartment is drying the gas or air while simultaneously the section of the drum in the other compartment is being reconditioned by hot air.

The principal application of these units employing solid drying materials, as well as those using liquid agents such as glycols, is the dehumidification of air. More and more homes, offices, plants and buildings are being air conditioned today, justifying continued work—research as well as development—in this field.

HOPEFUL TREND

In addition to the individual units discussed above, there exist many modifications depending on the particular use of the dryer. No claim is made for complete coverage of every minor development in the field. It is obvious that higher labor and fuel costs have caused improvements in heating efficiency, reductions of material loss, design of better control instruments and increases in unit capacities. As in all other fields, developments are a direct function of experimentation. In the last few years a greater number of equipment manufacturers have installed testing facilities to aid the customer in solving his problem. It is hoped that this trend continues since the design of the most suitable and economical unit depends on much fundamental data. Here the engineer has always been greatly handicapped.

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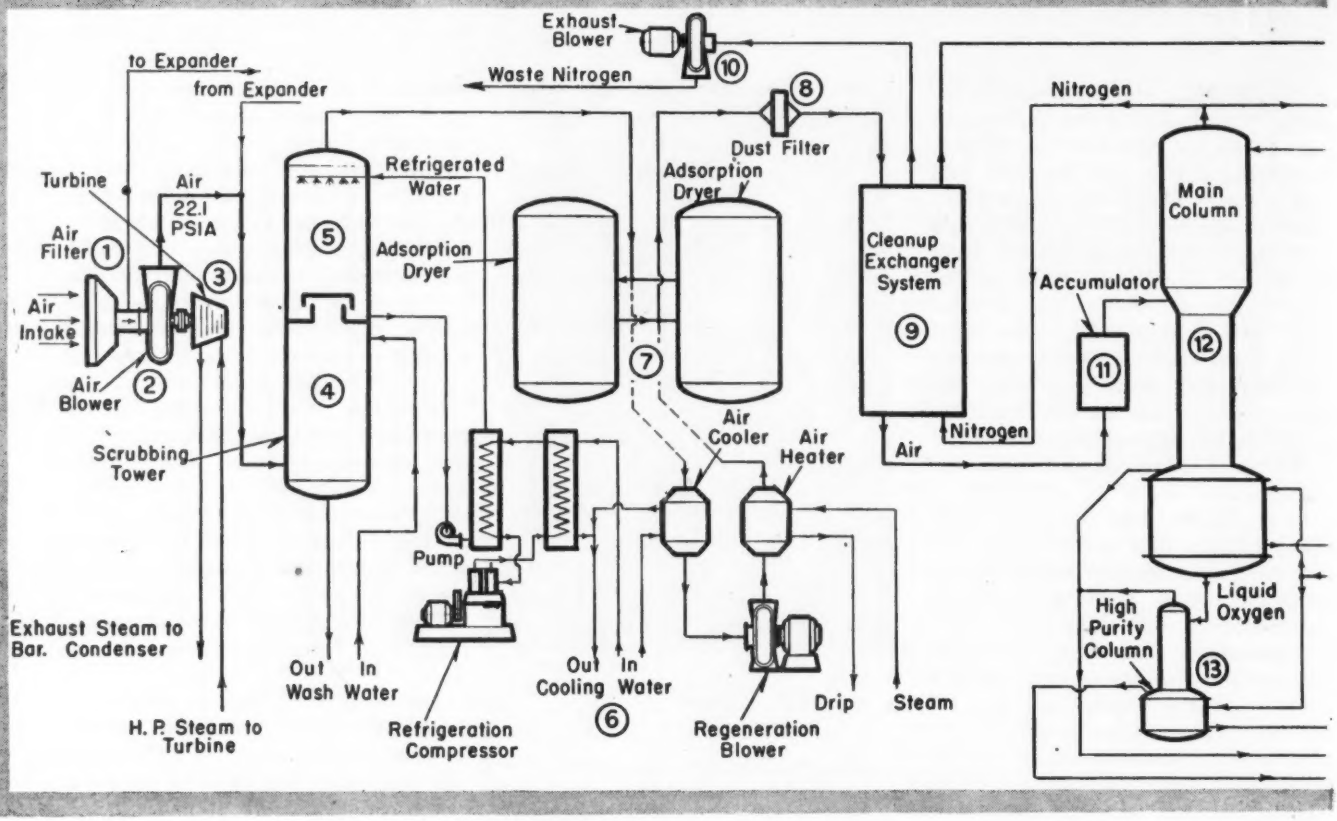


OXYGEN by Atmospheric Pressure Distillation

by B. H. VAN DYKE, Manager, New Products Department, Elliott Co., Jeannette, Pa.

PRODUCTION CYCLE for 95 per cent oxygen by Elliott process features flexibility, safety, automatic control, no shutdown time loss.

TONNAGE OXYGEN (oxygen of 90-95 per cent purity produced in tonnage quantities) may well be the giant on the postwar chemical horizon. Projected uses for this new commercial raw material include oxidation of natural gas or coal to produce "synthesis gas" for conversion into synthetic fuels by the American version of the Fischer-Tropsch process; large-scale production of hydrogen; partial oxidation of natural gas to produce a variety of oxygenated chemicals; enrichment of air for greater economy and efficiency of the blast, open-hearth, Bessemer, and electric furnaces in producing iron and steel; smelting of sulfide ores to reduce the production cost of non-ferrous metals, and secondarily to make the sulfur content available in a convenient form; production of city gas; and production of chlorine from ammonium or hydrogen chloride. Plants of from 150 ton-per-day to 2,000 ton-per-day capacity are now going up for a number of these purposes, and other possibilities may be uncovered as processes are re-examined because of oxygen's new lower cost.

*Patents applied for.

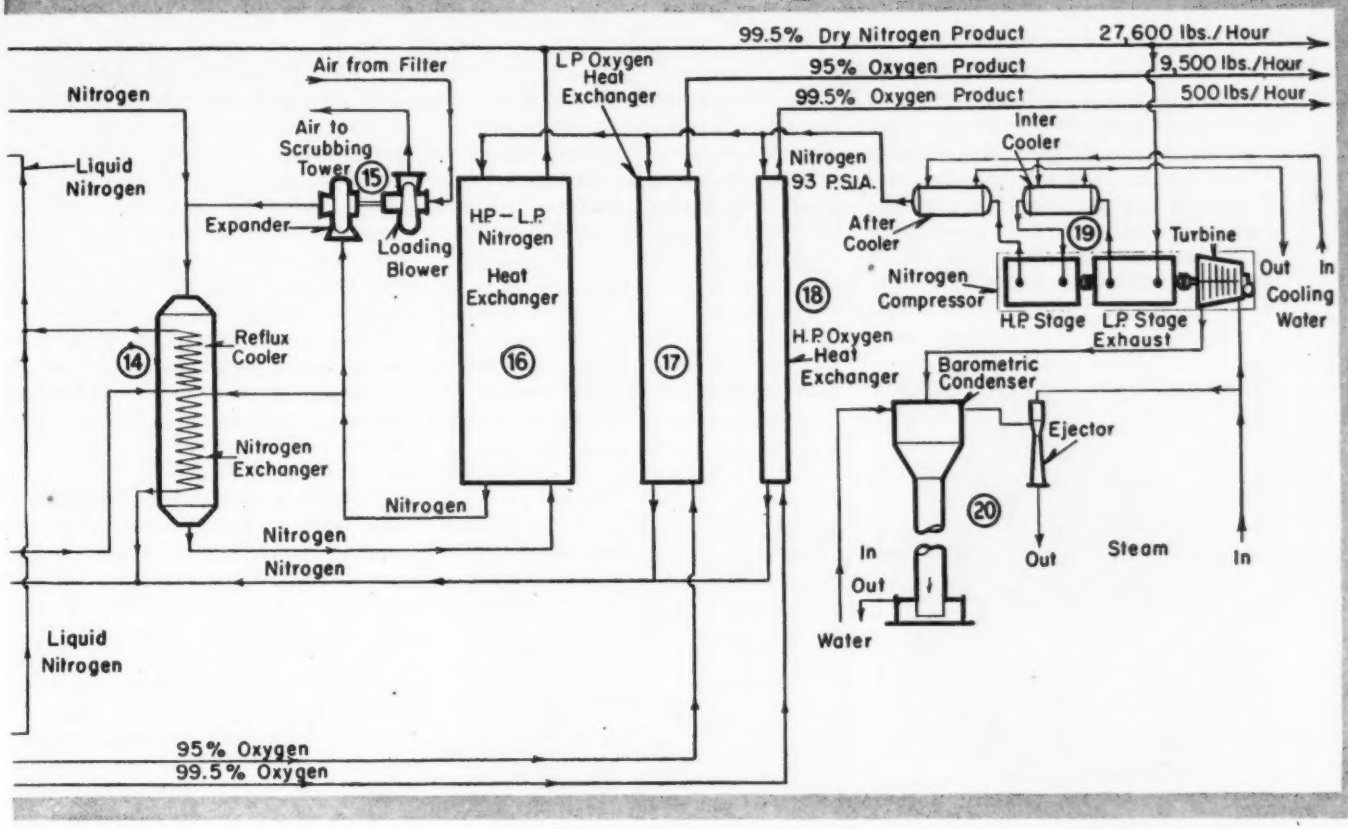
Equal to the excitement of chemists and engineers over availability of tonnage oxygen has been interest in the Elliott process* for producing it. The Elliott Co. has built its process around the low-temperature turbo-expander it developed for the government during the war in connection with the National Defense Research Council's oxygen program. Last summer, a nine-week run of its 10-ton-per-day pilot plant at Jeannette, Pa. demonstrated that the cycle can operate indefinitely without the shutdowns for defrosting "snow" that have been the main drawback of oxygen plants of other design.

AIR DISTILLATION

The Elliott cycle is an atmospheric-pressure air distillation system, so combined with a nitrogen liquefaction and refrigeration system to provide a unique combination of features and an unusual degree of safety and flexibility in operation. The features to be described further are as follows:

1. Periodic shutdowns for deriming are eliminated.
2. The system is completely immune to acetylene explosions.
3. The system operates at reduced loads without sacrifice of efficiency.
4. The system is mechanically simple.
5. All controls are automatic.
6. The recovery of oxygen from the air charged to the system is over 97 per cent. The nitrogen leaving the process is over 99.5 per cent pure.
7. Oxygen of any purity can be made.
8. A plant designed for 95 per cent purity can also simultaneously produce 99.5 per cent welding grade oxygen in required quantities.

The accompanying simplified flow diagram is for a plant designed to produce approximately 114 tons per day of 95 per cent purity gaseous oxygen, plus approximately 6 tons per day of 99.5 per cent high-purity gaseous oxygen, plus 332 tons per day of 99.5 per cent purity dry nitrogen. The recovery of oxygen from the air charged to the plant is approximately 97.5 per cent. The nitrogen product may be used for chemical synthesis without further purification. If a nitrogen product of higher purity is desired, it may also be obtained. The supplemental high purity oxygen product is made without increasing the horsepower per total unit of oxygen produced by the plant. This enables many users to obtain full re-



quirements of high-purity oxygen at the same cost per ton as the low-purity oxygen.

SLIGHT COMPRESSION

Outside air entering through filter (1) is compressed in an Elliott single-stage centrifugal blower (2) to a pressure only sufficiently above atmospheric to overcome friction loss in the equipment (shown as 22.1 psia). This pressure may be increased or decreased as an economic balance against pressure drop, which in turn is related to capital cost of the plant. This blower may be turbine- or electric-motor driven; greater flexibility may be obtained with turbine drive. A portion of the incoming air is compressed to the same pressure through the expander blowers (15), which parallel the air charging blower (2). This discharge from the expander blower joins with the discharge from the air-charging blower and flows into the bottom of a double scrubbing tower (4).

The air is dehumidified and freed of dust before entering the clean-up heat exchangers. This is accomplished by the use of a scrubbing tower in two stages (4) and (5). In section (4), river or other circulating water is used. In section (5) recirculating refrigerated water is employed so that the air leaving the top of the scrubbing tower is at approximately +40° F, dust-free and saturated with water vapor. The power required for the refrigeration system (6) is a small item charged against the total power for the production of oxygen

The air is next further dehumidified by passing through an absorption drier (7), a conventional system using activated alumina or similar desiccant and provided in duplicate for regeneration. Air leaving the drier is at a temperature of approximately +70° F, and a dewpoint of −40° F. A dust filter (8) removes traces of dust which may break loose from the drier during early stages of operation.

In the clean-up heat exchanger system (9), the air is cooled to approximately −310° F. Nitrogen from the top of the column (12) entering the heat exchangers at approximately −318° F is the cooling medium. In the cooling process, water vapor, carbon dioxide, and other impurities in the air are frozen out on the heat exchanger surface, which eventually will plug the passages unless provision is made for cleaning.

AUTOMATIC CLEANUP

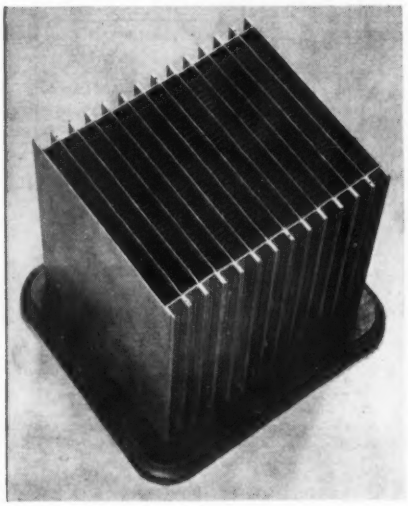
Nitrogen leaving the warm end of the clean-up heat exchanger is approximately 8-10° lower than the entering air. This bone dry nitrogen is used in quantity as required to regenerate or remove deposited impurities from the heat exchanger. The system is arranged so that through a combination of automatic valves on a fixed time cycle one heat exchanger bank at a time is switched from service and purged of deposited impurities. Experimental operation of the pilot plant indicates that approximately 10 per cent of the effluent nitrogen is required for this purpose. Since the flow of nitrogen through the heat exchanger being cleaned will be in series with the flow of nitrogen leaving the heat exchanger in service, it is necessary to provide sufficient pressure from the charging blower (2) to overcome this additional head. Rather than supply this horsepower to 100 per cent of the air charged, it has been found more economical to install a small exhaust blower (10) to suck the small amount of nitrogen which is required for the clean-up operation through the exchanger being cleaned. The nitrogen discharging from this blower will then carry all impurities previously deposited from the air.

The exchangers are automatically switched out of service for purging every four hours. By reducing the dewpoint of the air to −40° F before entering the clean-up heat exchanger system the time for clean-up of the exchange with respect to water vapor is brought into balance with the time for carbon dioxide. No economic benefit results from further reduction of the dewpoint of entering air.

NOVEL HEAT EXCHANGER

By accepted concepts of heat transfer, such as would be obtained with conventional shell and bare tube surface, over 100,000 sq.ft. would be required to perform the air-to-nitrogen exchange. Such a heat exchanger would not be operable. Design of suitable heat exchangers is imperative if a low cost tonnage oxygen plant is ever to become a reality. This has been the subject of intensive engineering development and has resulted in a heat exchanger surface which can be built in standardized sections at moderate cost. The heat exchanger lends itself to mass production techniques and the same standardized sections may be used for any plant regardless of capacity. This minimizes the replacement problem and lowers the plant investment. The heat exchanger consists essentially of thin cop-

per fins furnace-bonded between brass plates. It is manifolded so that one fluid will flow in one direction through every alternate passage and the other fluid will flow in the opposite direction through the intermediate passages. This arrangement of surface provides over 300 sq. ft. of effective surface per cubic foot of heat exchanger volume and corresponds to over 3.5 sq . ft. per pound of metal.



Model of gas-to-gas heat exchanger.

The fact that the air leaving the clean-up heat exchanger is at approximately 18 psia and −310° F constitutes the basis for the extremely effective removal of impurities by the Elliott system.

In Linde-Frankl type oxygen plants, the air at the corresponding point in the system is at a temperature of approximately −270° F, and a pressure of approximately 90 psia. The temperature difference of about 40° F is of great importance since in these lower temperature ranges the vapor pressure of carbon dioxide and other impurities decreases very rapidly with temperature. The vapor pressure of carbon dioxide, for example, is cut in half for each approximate reduction in temperature of 8° F. Thus the amount of carbon dioxide which can theoretically remain in the air leaving the clean-up heat exchanger of the Elliott plant is approximately one five-hundredth that in the air leaving the clean-up heat exchanger of a Linde-Frankl system. Best information indicates that Linde-Frankl type plants will be out of service for deriming approximately two days out of every 60. Since these shutdowns are apparently caused by accumulated deposits of carbon dioxide and since the Elliott clean-up system reduces the quantity of carbon dioxide by a large ratio over other systems, the Elliott system should be able to run many times longer, or for all practical purposes indefinitely, without a shutdown for the same cause. The performance of the pilot plant indicates that the only shutdowns required are for regular maintenance of the rotating machinery.

An accumulator (9) is provided in the air stream between the clean-up heat exchanger system and the main column to balance out the slight pressure and temperature fluctuations occurring when a heat exchanger is switched. Plants of the Linde-Frankl type must switch the clean-up heat exchangers or regenerators on an average of every two or three minutes. By virtue of the higher air pressure (95 psia, approximately) the surging resulting from switching poses a severe problem. In the Elliott system the differential pressure between the two sides of the heat exchanger being switched is only a few pounds gage; thus the surge is very slight, and the operation takes place only once every four hours. Nevertheless, the accumulator does serve a useful purpose in preventing disturbances on the feed tray during these periods. Also it acts as a safety factor in the removal of acetylene.

BUTTERFLY VALVES

The high initial and maintenance cost of switching valves common to other systems is minimized in the Elliott system by butterfly type valves. These valves are designed for operation only slightly above atmospheric pressure and a few pounds differential. The switching valves on other systems, functioning every few minutes, must be designed for a relatively high pressure and will always have a differential pressure of 60 psi or more.

The air leaving the equalizer or accumulator enters the main column (12) at the appropriate tray.

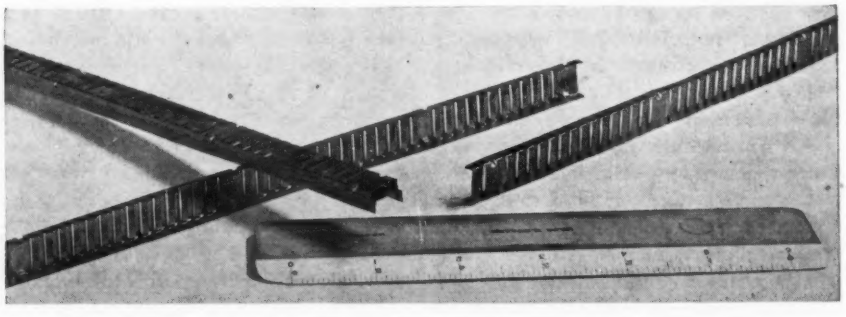
Essentially pure liquid nitrogen is supplied to the main column as reflux. The quantity is controlled to effect the most economic separation of oxygen from the air charged. The overhead gas from the top of the main column will be at a few pounds gage pressure and at a temperature of approximately −318° F, and a purity of approximately 99.5 per cent. A portion of this nitrogen is used in the clean-up heat exchanger to pre-cool the air. Another portion passes through heat exchanger (14), which is a combination reflux cooler and high-pressure nitrogen exchanger. This heat exchanger warms up the nitrogen a few degrees and, in so doing, subcools the reflux to minimize flashing before it enters the main column.

The nitrogen exchanger section provides a means of cooling high-pressure nitrogen to liquefaction temperature. The low pressure nitrogen leaving this heat exchanger passes into another gas-to-gas heat exchanger (16), is warmed up to approximately 60° F, and joins with nitrogen at the same temperature and pressure leaving the clean-up heat exchanger. A portion of this high-purity dry nitrogen stream is delivered as a useful product. The remainder is recycled to the process for making reflux and refrigeration. This portion passes downward into the suction of the nitrogen compressor (19).

The nitrogen compressor (Elliott multistage centrifugal compressor, with a conventional inter- and aftercooler) is the principal user of power. The nitrogen gas is compressed to approximately 93 psia. This main compressor always operates on clean dry nitrogen gas, and accordingly, will be favored from the standpoint of minimizing maintenance cost. Maximum plant flexibility can be obtained by steam turbine drive instead of electric drive since the speed may be varied to increase or decrease the amount of refrigeration and reflux for optimum plant operation.

The compressed nitrogen stream leaving the aftercooler is split into three streams, one through each of exchangers (16, 17 and 18). The bulk of the flow is through exchanger (16) in which heat is exchanged against the low-pressure cold nitrogen leaving the top of the fractionating column and exchanger (14). This high-pressure, low-pressure nitrogen heat exchanger is simply a "bootstrap" device for raising the temperature level of the low-pressure cold nitrogen gas to a point where it can be conveniently handled in a compressor, then putting the cold back in the high-pressure stream.

A sufficient quantity of the nitrogen leaving exchanger (16) passes through the Elliott turbo-expander (15) as required, to produce the plant's entire refrigeration demands. The temperature to the expander is approximately −253° F, leaving at approximately −318° F. Energy from the expander drives an integral centrifugal blower which parallels and correspondingly reduces the power required by the charging air blower. It has been confirmed by the operation of the pilot plant that a deficiency of refrigeration



Fin stampings which, upon assembly, form the gas-to-gas heat exchanger.

will always reflect in a lowering of the oxygen liquid level in the reboiler of the main column, and that a surplus of refrigeration will reflect in an increase of this level. This relationship is utilized to control the flow into the expander by means of a liquid level controller so that the operation of the expander becomes completely automatic and will adjust itself to changes in plant demand. The expander discharge joins with the stream of cold, low-pressure nitrogen coming from the top of the main fractionating column.

FRACTIONATION

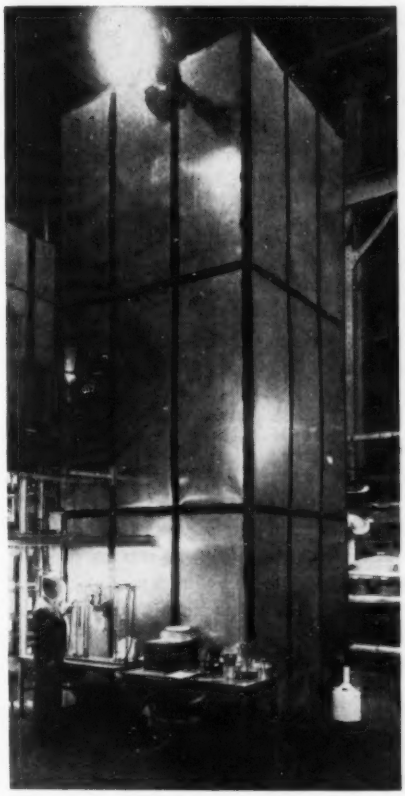
The remainder of the high-pressure nitrogen stream leaving exchanger (16), which is not diverted into the expander, passes down through the nitrogen exchanger section of heat exchanger (14) and joins with the cold high-pressure nitrogen streams coming from the exchangers (17) and (18). The combined streams then enter the nitrogen sides of the reboilers of the main and high-purity columns. At this point the nitrogen is liquefied by condensing against boiling oxygen on the other side of the reboiler tubes. The liquid nitrogen is controlled by a liquid-level controller and passes up to the top of the main column as liquid nitrogen reflux. No pump is required since the top column pressure is always considerably less than the pressure in the nitrogen side of the reboiler. The quantity of reflux may be varied simply by increasing or decreasing the speed of the nitrogen compressor, a function entirely independent of the amount of air charged to the system. This separate control over the making of nitrogen reflux and the supply of refrigeration gives the Elliott system its extremely high percentage of oxygen recovery and a wide latitude in operational flexibility. The quantity of liquid nitrogen required for this distillation can be related to a temperature difference between the top of the column and a point approximately five trays further down. This phenomenon can be utilized by means of a temperature difference controller to control the speed of the turbine driving the nitrogen compressor so that under any condition of operation the amount of liquid nitrogen supplied as reflux will always be the optimum; equal to the lowest total horsepower per unit of product.

Distillation takes place in the column and results in liquid oxygen collecting in the reboiler at a purity corresponding to the purity of the principal oxygen product, which for the case being described is 95 per cent. The gaseous oxygen product is taken off at approximately 5 psig and the corresponding saturation temperature and warmed up to room temperature through heat exchanger (17). Thus the cold from the oxygen product is returned to the system via the high-pressure nitrogen stream.

The purity of the oxygen product bears a definite relationship to the temperature distribution between the liquid oxygen in the reboiler and a point in the column approximately five trays higher which can control oxygen purity either by regulating the valve on the oxygen product stream or by controlling the speed of the turbine which drives the air charging blower.

HIGH PURITY TOO

The system can make both high-purity and low-purity oxygen simultaneously. 95 per cent purity liquid



Elliott's 10 ton-a-day pilot plant.

oxygen feeds as overhead to the top of a small stripper column (13) situated at a level beneath the main column. The overhead gas from this column is essentially 95 per cent purity gaseous oxygen and simply joins with the low purity gaseous oxygen stream. The high-purity oxygen product is taken off above the liquid level of the oxygen in the reboiler of the high-purity column and gives up its cold by exchange against some of the high-pressure gaseous nitrogen from the nitrogen compressor through exchanger (18), and is delivered at essentially room temperature. The nitrogen side of the reboiler of the high-purity column parallels the nitrogen side of the reboiler of the main column. The condensing of nitrogen in this reboiler provides the heat to boil off the high-purity oxygen product and the vapor loading for the operation of the column. The liquid nitrogen condensed in the reboiler flows by its own pressure head and joins with the liquid nitrogen going into the top of the main column. In this manner the high-purity column can deliver any quantity of high-purity oxygen within design limits.

This combination of functions gives the Elliott cycle an unusual degree of flexibility in operation. The plant can deliver various quantities of product required while maintaining constant purity irrespective of weather conditions, seasons of the year, and other factors affecting the performance of a low-temperature process. The plant can operate down to approximately two-thirds of full capacity without any sacrifice of horsepower per unit of oxygen product. An initial slight change in purity is experienced when operating conditions are changed. This is utilized by the automatic controls to bring the plant into balance within 30 minutes. During this interval the load is served from the reserve liquid in the reboiler.

NO ACETYLENE BUILDUP

Accumulation of acetylene from the air in the liquid oxygen in the reboiler of the fractionating column has caused many oxygen plant explosions. In the Linde-Frankl type oxygen plants air can be precooled only to a saturation temperature corresponding to the air pressure, not low enough to remove any acetylene while the air passes through the clean-up heat exchanger or regenerator. The acetylene works its way ultimately into the column. Although there are several methods for minimizing dangerous accumulations, they are costly from the standpoint of power and depend on the human element.

Because the Elliott system starts at a lower pressure, the air is cooled to a considerably lower saturation temperature. Operation of the pilot plant has confirmed that acetylene is actually frozen out on the clean-up heat exchanger surface as is carbon dioxide and water vapor. The air leaving the clean-up heat exchanger is saturated with acetylene under the conditions of temperature and pressure. This quantity is considerably less than the quantity which the gaseous oxygen product can always remove continuously from the system. Therefore a dangerous concentration cannot build up in the liquid oxygen in the reboiler. As a further safeguard, the accumulator (11) is filled with silica gel, an excellent absorptive agent for acetylene at low temperature. The accumulator is installed with a by-pass system so that every six months, without otherwise disturbing the operation of the plant, it may be removed from service and purged. This "fool proof" combination of functions to remove acetylene has been demonstrated in the pilot plant. Although traces of acetylene were in the entering air, none was found in the liquid oxygen in the reboiler after nine weeks of continuous operation.

An operator prepares ferrous sulfate, one of the catalysts used in making cold rubber.

Catalysis

(*Continued from page 596*)

gel, pumice, etc. by impregnating the support with solutions of metallic salts. These are further processed to give preformed catalysts in pellet, granular, spheroidal or powder form of specified size ready for use in the plant.

The advent of catalytic cracking and its war time expansion with its subsequent use of synthetic catalysts on a tremendous scale called for the creation of special catalyst-manufacturing facilities. Most of these were built during the war under government sponsorship. The manufacture of synthetic cracking catalysts has been continued by private groups who acquired these war-surplus plants.

Since the end of the war, the volume of catalyst business has been adequate to justify the commercial manufacture and sale of catalysts by several organizations.[9] The advantages to be gained include cheaper and more effective catalysts, since the concentration of this $15,000,000-per-year business in the hands of a few competitive specialists will justify development work and the installation of equipment that the catalyst demands of a single consuming company will rarely justify. Moreover, the purchaser will free the technical manpower assigned to his catalyst manufacture for more rewarding activity.

HOMOGENEOUS CATALYSIS

Homogeneous catalysis may be defined as a chemical reaction wherein the catalyst is homogeneously distributed throughout the phase where reaction occurs; thus homogeneous catalysts are soluble in the reacting phase.

The isomerization of paraffins and the joining of olefins with paraffins by alkylation are examples of homogeneous catalysis. These are new and important reactions in industry and are capable of application in other fields. Not so long ago the serious industrial consideration of these reactions would have laid any practical man open to suspicion, for the paraffins were regarded as chemically inert at moderate temperatures (about 100° F.) and their very name means "little affinity." During the war the all-important isooctane for aviation gasoline was made by the alkylation with olefins of the isobutane occurring in natural and refinery gases and in crude petroleum. But this supply of isobutane was inadequate and was augmented by the isomerization of normal butane to isobutane in war facilities built for the purpose.

The catalysts employed in the above reactions are invariably acidic in nature and include aluminum chloride, sulfuric acid and hydrofluoric acid. Aluminum chloride is used in the alkylation synthesis of ethyl benzene from ethylene and benzene, in the alkylation of isobutane with ethylene to diisopropyl, and in the isomerization of normal butane to isobutane. Ethyl butane can also be made with heterogeneous catalysts by alkylating benzene with ethylene in the presence of solid catalysts like silica-alumina or copper pyrophosphate. Sulfuric acid is used in the alkylation of isobutane to isooctane. Hydrofluoric acid is likewise used in isooctane synthesis; but its greater chemical stability permits higher operating temperatures and suggests its use in alkylations where yield considerations weigh heavily, or where the further utilization of spent sulfuric acid from the alkylation unit is impractical.

The alkylation reaction has already been applied to the synthesis of alkyl aromatics for sulfonation to wetting agents and detergents. Similarly, the normal butane isomerization technique can be applied to the conversion of methylcyclopentane to cyclohexane. The shortage of naphthalene has led to the use of orthoxylene from petroleum for phthalic anhydride manufacture by direct oxidation.

It seems likely that the isomerization technique will be applied to convert metaxylene to the ortho-isomer for conversion to phthalic anhydride, and to the para-isomer for conversion to terephthalic acid, valuable in fiber synthesis. Other isomerizations outside the hydrocarbon field will also doubtless prove economic.

EMULSION POLYMERIZATION

The success of the $700,000,000 government synthetic rubber program is well known and is the industrial culmination of catalyzed emulsion polymerization in the United States.

GR-S was a copolymer of 75% butadiene-25% styrene, and butyl rubber was a copolymer of about 95% isobutylene-5% isoprene. GR-S was polymerized in water emulsion at 122° F. using a peroxide catalyst. Butyl was polymerized at about —100° F. in ethylene dichloride solution with an aluminum chloride catalyst. Both came to industrial production after Pearl Harbor.

Neither was a direct replacement for natural rubber and it was freely predicted that they were war-babies who would not survive the peace. The future position of butyl rubber is not yet certain; but in 1947 a remarkable GR-S development occurred which may, in time, obviate the necessity of bringing in natural rubber, the largest single prewar import of the United States. This accomplishment was the making of a low-temperature GR-S.

It had long been felt that polymerization temperatures substantially below 122° F. would result in a better GR-S, but significant reductions in temperature resulted in impossibly low polymerization rates. The problem lay in drastically accelerating the rate of polymerization so that the normal 16-hour reaction time would not be unduly protracted.

Of the several groups working in this field in this country, Schulze, Reynolds and coworkers first demonstrated on a substantial pilot plant scale[10] that reasonable rates and yields of GR-S could be obtained at 41° F. by suitably modifying the catalytic nature of the polymerization system. Later they conducted similar emulsion polymerizations at 14° F. at practical rates using antifreeze to prevent freezing of the aqueous phase. A subsequent plant operation at 41° F. is described in detail by Shearon, McKenzie and Samuels.[4] The necessary speed-up in polymerization rate at 41° F. was obtained by the combined use of cumene peroxide instead of potassium persulfate, of tertiary instead of normal mercaptans, and of dextrose, ferrous sulfate and sodium pyrophosphate in the redox formula.

The trend in this field will be toward wider usage of low temperature GR-S and the adaptation of these or related techniques to other emulsion polymerization systems where modifications in existing polymers are desired.

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A CI REPORT ON

INDUSTRIAL CARBON

The Problem of Shortage, and What Can Be Done About It

by RAYMOND B. LADOO* and C. A. STOKES**

THERE ARE THE MAKINGS OF A CRITICAL SHORTAGE in the present scarcity of certain important types of industrial carbon, particularly petroleum coke and wood charcoal. Here is an attempt to evaluate the overall industrial carbon picture with respect to these shortages, consider possible substitutes, and suggest what may be done, through research, to improve our carbon raw materials. The problem touches a number of process industries.

ELEMENTAL carbon, in a more or less pure state and in its wide variety of types and forms, is one of the essential, basic chemical and industrial raw materials. It is used in a great number of products and processes.

Yet, some of the important types of carbon have received relatively little technical study. Insufficient is known about their properties and functions to tell whether one type or form can substitute for another in some essential uses.

This deficiency in our knowledge of industrial carbon is emphasized by the current shortages of certain important types, in particular petroleum coke and wood charcoal. These forms of carbon are used for electrodes required in the manufacture of aluminum, alloys, a number of other metallurgical products, and many electrochemicals. One or the other is the principal raw material in the manufacture of carbon bisulphide, electric motor brushes, and battery and arc carbons. Their continued shortage could become critical. It is the purpose of this report to inquire into the reasons for these shortages, their relationship to the industrial carbon picture as a whole, and suggest remedies.

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For purposes of this discussion industrial carbon is defined as solid carbon, reasonably pure, i.e. at least 85% carbon, and in the form either of the element or of complex highly polymerized hydrocarbon compounds of low hydrogen and oxygen content and negligible content of other elements in chemical combination with carbon.

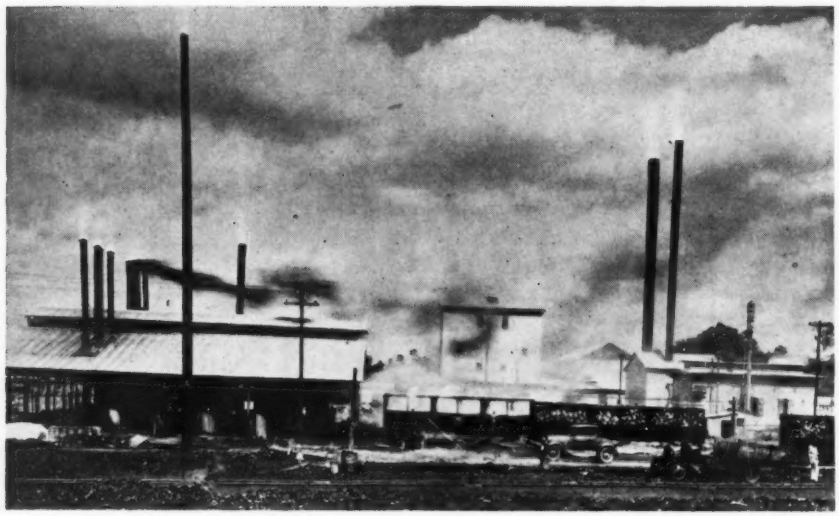
USES AND SOURCES

The study is concerned only with those fields of use in which carbon as an element is an essential raw material and in which carbon appears as an ingredient of the finished product or has an important intermediate processing function. Uses strictly as a fuel, as for house heating, or large scale uses where it functions both as a fuel and a reducing agent, as in iron blast furnaces, are not included. Uses of carbon black and lampblack as either color pigments or rubber reinforcing agents and fillers are also omitted. Any shortages of raw materials in these fields are local and temporary.

In Table I the industrial uses of carbon are broadly segregated by a scheme that places the various uses in logical groups. Groups I and III have been ruled out of this study entirely, but in Group II it has seemed best to omit only the iron blast furnace use of carbon. The other uses in Group II are apt to be sufficiently specialized to warrant careful study of the specifications for and supply of raw material for each. Thus in open hearth steel manufacture the carbon added to purified iron to make carbon steel must be of higher purity than ordinary blast furnace coke and in the manufacture of charcoal steel the purity of the charcoal is an essential factor.

However, it is with the uses of carbon in Group IV that this paper is mostly concerned. For these uses, coke from coal, which is the largest single source of industrial carbon, is rarely satisfactory because of deficiencies in purity or physical characteristics.

The sources of industrial carbon are classified in Table II. It should be pointed out that industrial carbon raw materials rarely appear on the market in the form in which they occur in nature, but usually in the form of derived products, and these are often by-products rather than the principal product of the process from which they originate. For example, charcoal is a by-product of the production of wood chemicals, while petroleum coke is a by-product of petroleum cracking to produce gasoline and distillate oils. This greatly complicates the problem of supplying specification material.



Softwood distillation plant of the Cabot Carbon Co., Gainsville, Fla.

The diagrams in Figure 1 on next page illustrate the stages through which various raw materials pass before becoming the final marketable industrial carbon raw material. These diagrams also list the principal forms of industrial carbon, using the recognized terminology.

In addition to coal, petroleum, and wood, various other carbonaceous materials may be subjected to destructive distillation to crack and drive off volatile matter, leaving solid carbon. Lignite, or brown coal, is coked extensively in Europe to yield products similar to those from bituminous coals, bones are destructively distilled giving bone char, mineral carbon is retorted to drive off volatiles, and oil shale is distilled to yield a crude petroleum that is subsequently processed by conventional methods. Large deposits of asphalt may some day be processed for the fixed carbon they contain.

PROPERTIES

Carbon is one of the commonest of the elements and occurs naturally in more forms than most. But, strangely enough, pure carbon is extremely rare, both in nature and in present commercial products.

Carbon exists as an element in many forms which differ greatly from each other in their physical and chemical properties. Thus the diamond and graphite have almost nothing in common except that they are both elemental carbon. Unlike most elements which may exist in several forms, such as sulphur, it is difficult if not impossible by present known methods to change carbon from one form to another at will. The best example is that, as yet, we are unable to make artificial diamonds. While it is true that artificial graphite may be made from coal and other forms of carbon, the graphite so produced is quite different in its physical properties from natural graphite and is unsuitable for most crucible manufacture. The X-ray diffraction pattern recognized as typical for pure crystallized graphite may be closely approached with artificial graphite without being able to duplicate the physical properties.

For many years the consumers of carbon for the principal industrial uses have clung fairly closely to their favorite forms of carbon without much effort to adapt other types to their exacting needs. As long as their supplies were plentiful and cheap they could with safety develop their processes and products around these chosen raw materials. But, for a variety of reasons, production of suitable grades of some of these materials has declined and is still declining while demand is increasing.

The one mainstay of many important Group IV carbon products has been petroleum coke. It has been used for many years as the principal source of carbon for making electrodes for the aluminum industry and for most other types of electrodes and anodes for electrometallurgical and electro-chemical use, as well as motor brushes, battery and transmitter carbons, arc carbons, and a great variety of other products.

In some of these products other forms of carbon are used, but usually only as adjuncts to rather than as replacements for petroleum coke. Aluminum electrodes are made almost entirely from petroleum coke with a pitch binder. When it is realized that 0.5 to 0.6 lbs. of primary carbon is needed for each pound of aluminum made, the importance of carbon suitable for aluminum electrodes is evident. No satisfactory substitute for petroleum coke for this use has yet been found in this country as far as can be learned. For dozens of other end uses petroleum coke is considered an essential or at least a strongly preferred source of carbon.

A different but closely analagous situation is that of carbon for making carbon disulphide, an essential chemical in the rayon industry. The standard source of carbon for reacting with sulphur has been lump hardwood charcoal. No other type of carbon has as yet been found a satisfactory substitute, although high grade lump softwood charcoal is beginning to be used with success. The demand for carbon disulphide is increasing and the

TABLE I—USES OF INDUSTRIAL CARBON

I. Solid fuel and fuel raw material
(*U. S. consumption: approx.* 500,000,000 *tons per year,* 1945)
- A. Domestic heating
- B. Generation of steam for power or process use
- C. Industrial processes using direct heating
- D. Manufacture of gas
- E. Manufacture of coke

II. Fuel and reducing agent combined
(*U. S. consumption:* 51,000,000 *tons coke for iron blast furnace alone,* 1945)
- A. Ferrous metallurgy (iron blast furnace, open hearth, foundries, etc.)
- B. Non-ferrous metallurgy

III. Pigment
(*U. S. consumption: approx.* 500,000 *tons per year, including exports*)
- A. Coloring (paint, inks, plastics)
- B. Reinforcing and/or filler use (rubber)

IV. Other industrial uses
(*U. S. consumption: approx.* 2,000,000 *tons per year*)
- A. Material of construction
  1. Electrical conductor or resistor
     a. refractory electrical conductor (electrothermal processes)
     b. corrosion resistant conductor (electrolytic processes)
     c. other (resistors, electrical motor and generator brushes, seal rings, etc.)
  2. Heat conductor
     a. refractory heat conductor (graphite crucibles)
     b. corrosion resistant heat conductor (carbon pipe)
  3. Corrosion resistant material (lining for acid tanks, etc.)
  4. Heat insulator (lampblack for graphitizing furnace insulation)
- B. Chemical reactant
  1. Reactant appearing in final product (e.g. in CS_2, CaC, SiC, NaCN)
  2. Reactant used in intermediate process (e.g. in manufacture of Na_2S and BaS)
- C. Adsorbent (solvent recovery, decolorizing, deodorizing, etc.)
- D. Lubricant (graphite)
- E. Abrasive (industrial diamond)
- F. Moderator for nuclear reactions (atomic pile)

supply of charcoal is decreasing or, at least, not increasing fast enough to keep up with the demand. Numerous other examples could be cited, but these two situations illustrate the problem.

The difficulty is in part technologic and in part economic. At high enough price levels either the production of the favored raw materials would be increased or acceptable substitutes might be developed. Judging from the results of research work done so far, the development of substitutes will not be easy and the price levels probably must be considerably higher than for the presently favored materials. It is possible, however, that in some cases the new materials might be enough more efficient than the old to offset, in part, the increased cost.

More detailed consideration of the exact properties of industrial carbons suitable for various uses would consume considerable space, but a general description of the properties usually considered will be given.

A new source of carbon would usually be examined by the proximate analysis methods for moisture, fixed carbon, volatile matter, and ash. Sulphur is determined independently. If of sufficient importance, an ultimate analysis for total carbon, hydrogen, oxygen, nitrogen, sulphur and ash constituents is made. Spectrographic analysis is a convenient method for determining the metals present in small quantities (1% and less). Heating value is not important except for fuel uses.

In addition to properties of a chemical nature, there are many physical properties of importance. Some of these are: allotropic form (diamond, graphite, or amorphous), hardness, abrasiveness, lubricating properties, density (true and apparent density of aggregates and bulk), particle size distribution of primary particles and secondary aggregates from submicroscopic up to subsieve range (—325 mesh), particle size distribution of particles from 325 mesh up to lumps of inch

TABLE II — SOURCES OF INDUSTRIAL CARBON

I. Mineral
  A. Diamond
  B. Graphite
  C. Natural amorphous carbon
  D. Coal
    1. Anthracite
    2. Bituminous
    3. Lignite
  E. Peat
  F. Asphalt
  G. Petroleum
  H. Oil Shale
  I. Natural Gas
II. Vegetable
III. Animal

size, structural strength of aggregates, surface area per unit weight of material, surface adsorptive properties (for gases and liquids or solids out of solutions) liquid absorptivity (absorption of liquids in spaces between aggregates), ease of graphitization, electrical resistivity (or conductivity) and reactivity (with oxygen, sulfur, etc.).

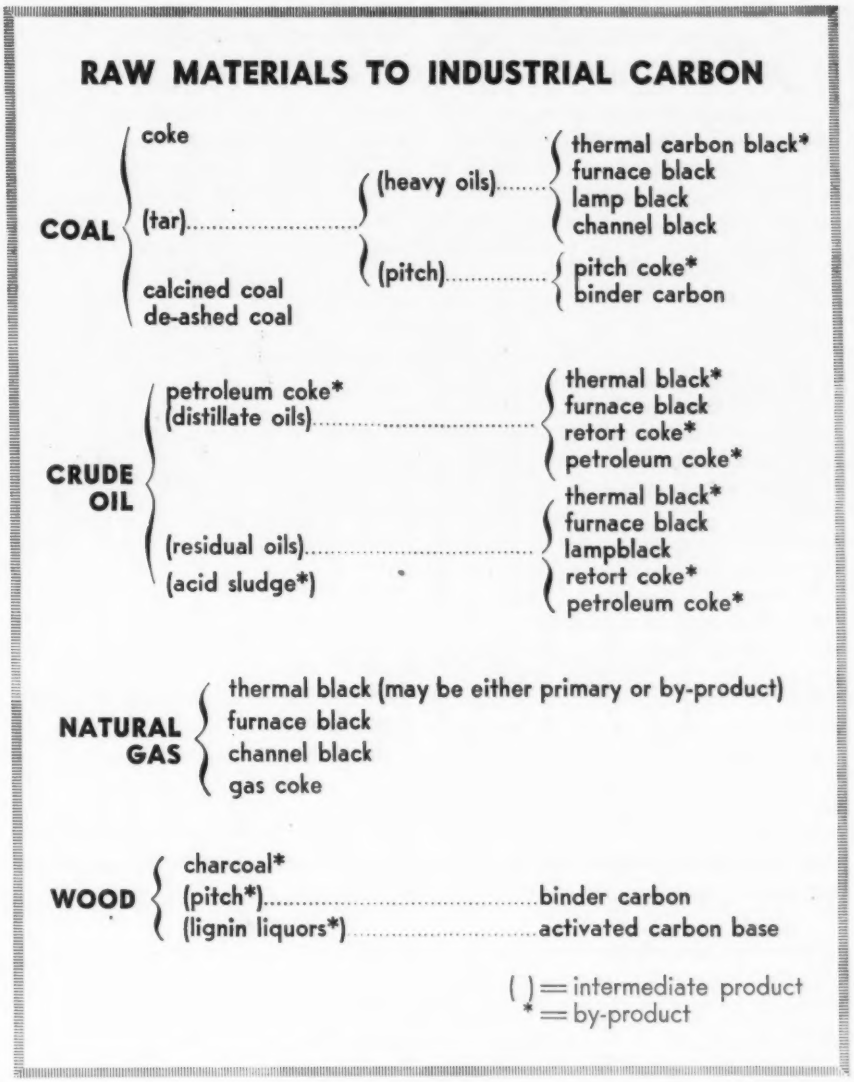


Figure 1

For many uses the determinations of physical properties are partly or wholly upon empirical bases. Too little is known about the behavior of carbon under various conditions to enable us to devise standard testing methods and specifications for many uses. Selection of raw materials is often on a trial and error basis.

ECONOMICS OF THE PROBLEM

The technological problem of developing substitutes is made far more difficult by the economic problems involved. The industrial user whose products, processes, costs, prices, and markets have been keyed to a raw material costing say $20 per ton delivered will find it difficult to adjust himself psychologically or economically to a substitute which may cost him $60 per ton delivered. The research man trying to develop a substitute cannot consider as a starting point a material which now sells for 3½ to 10¢ per pound, no matter how plentiful it is or how desirable technologically. For example, we can hardly consider carbon black as a starting point for making a substitute for petroleum coke for low priced uses when the raw material cost alone for the higher yield carbon blacks is about equal to the f.o.b. refinery price for green coke.

Another factor in the economic problem is the geographical locations of consuming industries and their distances from present and possible future sources of suitable industrial carbon. Freight rates, now high and continually increasing, may amount to more than the sales price of the material.

While it is true that many consumers

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can really afford to pay considerably higher prices without restricting their markets, since their competitors presumably will all be in the same boat, there is a point in some important instances where too high carbon costs might seriously curtail markets. If aluminum makers were forced to pay $40 more per ton for their electrode carbon their finished aluminum would cost at least 1¢ more per pound. Where aluminum competes with other metals on a price basis this might be an important factor.

But research men must have some idea as to possible permissible price levels in order to narrow their fields down to commercial realities. One method of approach might be to find out at what price level petroleum refiners would be interested in making petroleum coke as a primary product instead of as a by-product. Another approach would be to ask consumers if they would be interested in testing samples of new forms of carbon which might sell for say $50 per ton or if they could find use for any important tonnage of carbon at about that figure. These approaches have been followed to a limited extent. Neither was highly successful, but the attitudes of the people interviewed threw considerable light on permissible price levels.

It will not be possible to include in this paper a detailed discussion of each industrial carbon, but the several carbons used in greatest volume will be discussed in order of importance (from a tonnage use standpoint).

PETROLEUM COKE

Although petroleum coke was once produced as an unavoidable by-product of direct-fired shell stills and later as an unwanted by-product of the early thermal cracking systems, coke production in modern delayed coking thermal cracking units has become a specific operation that is applied under favorable market conditions in which there is relatively less demand for heavy residual fuel oil and more demand for gasoline and petroleum coke.

Much of the present production of petroleum coke is from delayed coking plants that are designed to produce a maximum yield of gasoline and distillate oil with petroleum coke rather than heavy fuel oil as a by-product. In the more modern delayed coking plants, the coke is removed hydraulically and conveyed by a stream of water to the storage pile.[1] There are 13 delayed coking plants in operation or under construction in this country having a capacity of approximately 40,000,000 bbls. of reduced crude annually and an output of around 800,000 tons of petroleum coke. The major units, their locations, and capacities are given in Table III. In addition to these plants, it is reported that new coking facilities are planned in the St. Louis and Toledo areas and would add to petroleum coke production by about 100,000 to 300,000 tons per year.

Additional petroleum coke is produced in older thermal cracking units of the Dubbs type. Present high coke handling costs and high prices for residual fuels place this type of unit in a poor economic position compared to delayed coking with hydraulic handling or to the vacuum distillation and vis breaking methods of refinery operation, which produce no coke at all. It is reported that coke production is to be curtailed in certain of these older type units in the St. Louis area.

A unique installation on the West Coast, apparently the only one of its kind in the country, produces 12,000 to 25,000 tons of by-product petroleum coke per year in an oven especially designed to produce a high yield of city gas from heavy oils.

There is a wide variation in opinion among petroleum refiners as to whether petroleum coke should be produced in their respective market areas. For example, a large new coking plant (183,000 tons per year) has recently been put in operation on the West Coast in a period when other refiners in the same area feel that it is advantageous to produce no coke at all. In general, the coastal areas, because of better markets for heavy fuel oil, produce less coke per barrel of oil refined. The data in Table IV illustrate this point without exception. The 470-fold variation between the East Coast and the Indiana-Illinois-Kentucky areas is ample evidence that the differences in markets can have a pronounced effect on refinery operation. The Indiana-Illinois-Kentucky area serves one of the largest U. S. markets for industrial carbon.

If one is to judge only from the current inadequacies in the supply of petroleum coke for industrial uses, it would be concluded that petroleum coke production is declining. That such is not the case is indicated by the data in Fig. 2. Coke production for 1947 was probably at least as high as that for 1946 because of the addition of the new plant at Torrance, California (see Table III).

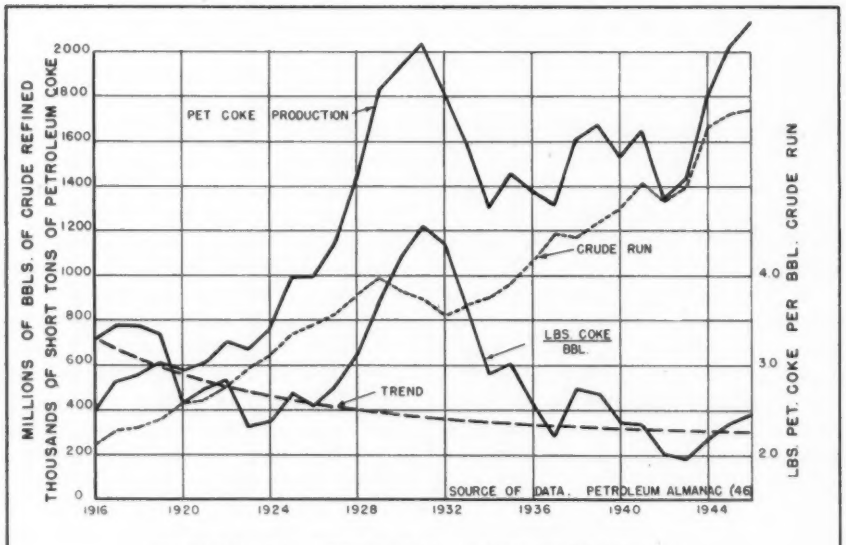
Certain conclusions can be drawn regarding the petroleum coke situation. These conclusions are based on a careful factual study of trends in the petroleum and carbon (petroleum coke) consuming industries.

While the production of petroleum coke is increasing, the demands have also been increasing and it is apparent that the demand is getting ahead of the supply. The data in Fig. 3 show the production and demand data, although unfortunately there is no indication of the relative importance of the various types of demand. It is certain that the industrial uses of petroleum coke have increased considerably relative to the strictly fuel uses.

Although the 1946 petroleum coke production was the highest recorded, the production of coke can be expected to level off in the years ahead for several reasons.

First, the amount of crude refined is expected to level off because of dwindling of supplies.

Second, the amount of petroleum coke produced per barrel of oil refined is trending down from somewhat over 3 lbs. per bbl. to about 2.2 lbs. per bbl. (see Fig. 2). This trend will no doubt continue. A significant fact on this point is: the largest refinery in the world produces no coke at all, and the company operating this refinery is one of the world leaders in refining technology. As the older thermal cracking units are replaced by catalytic cracking and as the shortage of crude and liquid fuels of all types grows,



TRENDS IN PETROLEUM COKE PRODUCTION

Figure 2

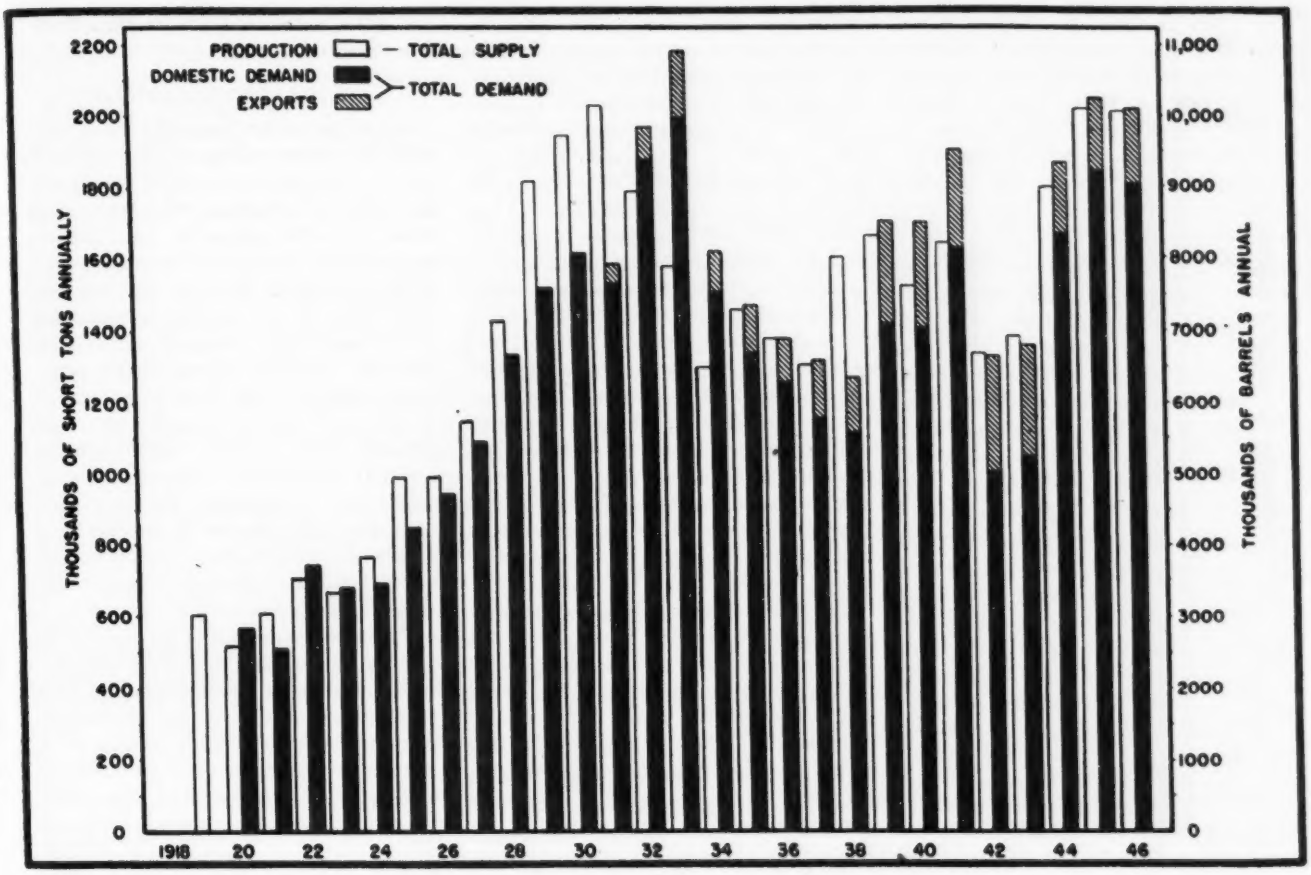


Figure 3—Production and consumption of petroleum coke.

TABLE III—PRINCIPAL DELAYED COKING PLANTS IN U. S.

Company	*Location*	*Design Capacity tons per year*
Standard Oil Co. (Ind.)	Whiting, Indiana	65 000
Atlantic Refining Co.	Philadelphia, Pa.	97,000
Continental Oil Co.	Ponca City, Okla.	42,000
Magnolia Petroleum Co.	Ft. Worth, Texas	38,000
Union Oil Company	Oleum, Calif.	126,000
Std. Oil of Ohio	Toledo, Ohio	42,000
Socony-Vacuum Oil Co.	Trenton, Mich.	52,000
General Petroleum Co.	Torrance, Calif.	183,000
Cities Service Oil Co.	East Chicago, Ind.	138,000
Pure Oil Co.	Toledo, Ohio	48,000
	TOTAL	831,000

TABLE IV—U. S. PETROLEUM COKE PRODUCTION, 1944

Region	*Crude Run Bbls./ 1,000,000*	*Coke Production Tons/ 1,000*	*Lbs. Coke per bbl. crude*	
East Coast	275	2.2	0.017	
Appalachian	56	24.8	0.89	
Ind., Ill., Ky.	279	1,110	7.95	
Okla., Kans., Mo.	133	138	2.07	
Texas	492	271	1.10	
La., Ark.	113	139	2.36	
Rocky Mt.	41	47	2.29	
California	295	72	0.49	
	1,666	1,803	2.17	weighted average

Source: 1946 Petroleum Almanac, p. 82, 93

there will be a tendency to install non-coking type auxiliary units to make feed stocks for catalytic cracking. A substantial increase in the price of petroleum coke could alter this tendency.

It is interesting to note that the amount of petroleum coke produced per barrel of oil refined increases in time of stress (see Fig. 2). Thus the ratio went up in the periods 1916-1919, 1928-1936, and 1943 to date. In the period 1941-1943, coke production per barrel of oil went down because of the sharp drop in demand for gasoline and the great increase in demand for bunker oils for naval and merchant marine use. In the present period the demand for distillate oils and gasoline is at an all time high and, as a consequence, in many refineries coking operations are increased to give greater yields of these higher priced products and lower yields of the less profitable residual fuel.

From the data presented above it would seem that there should be no shortage of industrial petroleum coke. But other factors enter into the picture. These are: (a) suitability for industrial use of coke produced and (b) industrial demand.

Quality. For most industrial uses, low sulphur and low ash coke are needed. With present shortages of petroleum products, increasing amounts of high sulphur crudes are refined, yielding high sulphur coke useful mainly as a fuel. In addition lime, acid, and other chemicals are being added in refining processes, raising the ash content of some cokes from under 1% to as much as 9% or higher and making the coke unacceptable for many uses.

Demand. For such large scale uses as aluminum electrodes, anodes, refractory shapes, etc., demand for petroleum coke has been increasing. The net result is that the supply of suitable industrial coke has been decreasing while the demand has been increasing.

Price trends are a reliable indication of supply and demand balance when no price controls exist. It is difficult to quote exact prices for petroleum coke because of the rather chaotic situation in today's coke market. However, the indications are that green coke has risen in price since 1941 from well below $10 (in some cases as little as $5) per ton f.o.b. refinery to $15 or even as high as $20 per ton. Calcined petroleum coke is approaching the $40-50 per ton level in the Great Lakes area, having risen from $20-30 per ton.

WOOD CHARCOAL

As has been noted, wood charcoal is the source of carbon considered essential for the manufacture of carbon disulphide. In addition about half the production of charcoal is used in the metallurgical industries, chiefly electrometallurgical, where its function is both that of a reducing agent and a fuel.

In normal times about 10%, or pos-

sibly more, of the charcoal is consumed solely as a fuel. Table V shows the latest available data on charcoal uses (Jan. 1, 1944 to June 30, 1945). Production was practically all allocated during this period, so total consumption was approximately equal to total production. The end use pattern is believed to be fairly close to that existing today.

Hardwood charcoal is favored for most charcoal uses and has been used almost exclusively when obtainable, although there is no basic reason why softwood charcoal may not be used in most cases. The destructive distillation of hardwood was formerly practiced to yield methanol, acetone, acetic acid and calcium acetate as the most profitable products, with charcoal as an incidental by-product.

The development of cheaper methods for the synthetic production of these chemicals, together with increasing costs for wood, has gradually forced many plants out of business. On the other hand, there can be little doubt that the well integrated hardwood distillation plants will continue to operate at a profit. In one case, integration of pulp wood, paper, and lumber production with hardwood distillation has provided circumstances favorable to the hardwood distillation operation. In another case, hardwood charcoal production is integrated with charcoal steel production. Ford Motor Co. has for years operated a hardwood distillation plant on by-product scrap wood, although in recent years the supply of scrap wood has greatly diminished. Recently a number of small hardwood distillation plants in one general area have been consolidated under one management to provide a sounder basis for continued operation. Some increases in plant facilities are being made.

A review of the economics of hardwood distillation has been made recently.[2, 3] There is a continuing market for natural methanol as a denaturant for ethyl alcohol, and, as long as the shortage of synthetic methanol persists, there is a large market for natural methanol for antifreeze. However, it seems unlikely that the price of natural methanol can remain at more than twice the price of synthetic methanol for much more than another 2 years.[4, 5]

Softwood charcoal plants usually produce in the way of chemicals only pine tar and terpene hydrocarbon solvents. These products have a good market in the rubber, cordage, and paint industries so that softwood charcoal plants are in a somewhat better economic position than most hardwood charcoal plants from the long-range point of view.

Representative values of moisture, fixed carbon, volatile matter, and ash for several hard and softwood charcoals and hardwood charcoal briquettes are given in Table VI.

An extensive survey of the properties of charcoals from various woods and from various types of retorts is given by Risi[6] *et al* of the Quebec Forest Products Laboratory. This same agency has issued a series of bulletins on charcoal production and properties.[7] Risi and Deschenes[8] have discussed the effect of process variables on the properties of charcoals. There is little difference between hardwood charcoal and softwood charcoal if the latter is made in well designed retorts and cooled in closed charcoal coolers. The larger softwood charcoal plants are so equipped and the product is much higher quality than the charcoal made in plants where direct water quenching is used. It is significant that softwood charcoal has very low ash content. It is, in fact, one of the purest forms of carbon available, if hydrogen and oxygen be disregarded. Calcined softwood charcoal could be made to approach 98% carbon content.

At present lump softwood charcoal is quoted at $20 per ton or less f.o.b. plants in Florida, Louisiana, and Georgia, the principal producing states. Hardwood charcoal, which is made principally in Pennsylvania, Michigan, New York, Arkansas, and Tennessee, is currently quoted at about $35-50 per ton f.o.b. plants. It would seem that softwood charcoal might become an attractive raw material for the manufacture of calcium carbide and amorphous electrodes as well as certain other uses in which purity is an important factor, especially if high grade petroleum coke advances further in price.

For carbon bisulphide, lump charcoal is needed with high "reactivity." Reactivity is poorly defined and its fundamental causes are little understood, but it means the ability to combine with sulphur under the conditions of carbon bisulphide manufacture. Specific surface area, that is surface per unit mass is an important factor in reactivity, but other factors are important such as ash content (and composition of ash) and degree of pre-activation. In wood charcoal, at least, high volatile content may correspond to low reactivity. Petroleum coke as well as nearly all other substitutes so far tried are much lower in reactivity than hardwood charcoal.

TABLE V—END USE DISTRIBUTION OF WOOD CHARCOAL

(*For period Jan. 1, 1944 to June 30, 1945*)

Total production during period
440,000 short tons

End use distribution:	
Mining & Metallurgy	48.9%
Carbon bisulphide	15.7
General domestic	5.3
Activated carbon	4.0
Poultry & stock feed	3.5
Tobacco curing	3.0
R. R. dining cars	2.6
Black powder	2.3
Acetylene gas cyls.	1.3
Tinners, roofers, plumbers	0.9
Laundries	0.8
Welding	0.7
Meat & fish curing	0.6
Glass	0.3
Graphite & process carbon	0.3
Miscellaneous	7.0
Export	2.8
TOTAL	100.0%

MISCELLANEOUS CARBONS

Retort carbon is a form of coke deposited in the retorts used in making coal and water gas largely in municipal gas plants. It is often a by-product of carburetion of water gas with petroleum oils. The retort coke deposits on the heated checkerbrick carburetors. Production at any one plant is small and production points are widely scattered. Quality is not uniform from any one plant or from plant to plant. Due to changing processes of gas manufacture, production is declining. This valuable type of carbon, used chiefly by carbon brush makers, is becoming so scarce that it cannot be depended upon even as a minor source of supply. It is known that a synthetic substitute for this material can be made if there is sufficient demand for the product.

Pitch coke is made by carrying the distillation of coal tar (from either by-product coke ovens or gas manufacture) to a solid residue, similar to the cracking of petroleum fractions to ultimate yield. Pitch coke is similar to but by no means identical with petroleum coke. Some electrode manufacturers expect to turn to pitch coke when petroleum coke is no longer available. However, pitch coke, since it is made in smaller units without mechanical coke discharging equipment, will be a more costly product. The U. S. production of pitch coke in 1946 was 93,000 tons[9] or about equal to 5% of the petroleum coke production. Pitch coke inventory was valued at $15 per ton at the plant in 1946. Present sale price would be expected to be considerably higher. Total production of crude coal tar (all types: coke oven, retort, water gas, oil gas) in 1946 amounted to only 3,800,000 tons, so it is clear that coal tar cannot supply enough coke to replace any appreciable quantity of petroleum coke.

Coal coke is too high in ash to be used for most industrial carbon uses, although it is one of the materials used for making calcium carbide. For this use it is essential that the ash be extremely low in phosphorus.

Anthracite coal specially selected and very low in ash is used to a limited extent, for example in aluminum pot linings, and for some types of graphitized electrodes, but it is not sufficiently pure to be used as a substitute for petroleum coke for most purposes.

Carbon black and lampblack are minor ingredients in certain carbon products such as motor brushes. They are so finely divided that they do not have the coarsely granular structure needed for most uses. The very large specific surface requires excessive amounts of binders. While these materials may be bonded with pitch and calcined to form a hard coke the product consists of 50% or more of pitch coke.

By-product thermal carbon black. The amount of relatively pure carbon produced as a by-product of thermal cracking of oils and natural gas is not insignificant compared to the production of petroleum coke.

This type of carbon is produced in regenerative checker brick cracking units used either for (1) production of city gas from petroleum oils[10] or (2) production of hydrogen for ammonia synthesis or other use. The carbon is usually separated from the gas stream by water scrubbing followed by thickening, filtration, and, if a market outlet is available, the product is dried. In some plants the carbon is briquetted. No binder is added as 10-15% of tarry matter is present on the black and acts as binder.

The extremely finely divided form of this carbon (particle size about 5,000 angstroms)* restricts its use for electrode mixes. The high oil absorption makes it necessary to use an excessive amount of binder, resulting in weak electrodes. More serious, perhaps, is the high cost of handling and shipping this sort of black. It is low in density (about 25 lbs. per cu. ft.) and, except when it is briquetted, must be shipped in bags.

The estimated annual production of by-product thermal carbon black is about 175,000 tons, all produced on the West Coast. The sale price is $15 to $20 per ton f.o.b. plant. Some of this black is sold as a fuel for domestic use and some is used for plant heating. Formerly some of this type black was sold for pigment use. There is, however, one plant in operation producing thermal black as a primary product for pigment use. The raw material is natural gas; hydrogen is the by-product in this case. The production from this plant is not included in the above production figure.

By-product thermal carbon black is low in ash (less than 0.35%) and may be low in sulfur, depending upon the raw materials used. It could be converted into a more usable form but the expense of doing this has been prohibitive so long as green petroleum coke was available at $10 per ton and less.

Natural graphite occurs in three forms, crystalline lump, crystalline flake, and amorphous. Natural graphites are not used in electrode manufacture, both because they are too high in price and because artificial graphite is more suitable. Both crystalline lump and flake are used, along with other types of carbon in making motor brushes, but the problem of supply is not urgent.

Artificial graphite cannot be considered a basic carbon raw material since it is made from petroleum coke and, to a lesser degree, from anthracite coal. Ash content of carbon raw materials for making artificial graphite is not as important as in non-graphitized carbon products since most of the ash is volatilized at the temperature of graphitization.

* However, this carbon is much larger in particle size than the lampblacks or carbon blacks except the so-called thermal carbon blacks.

SUBSTITUTES

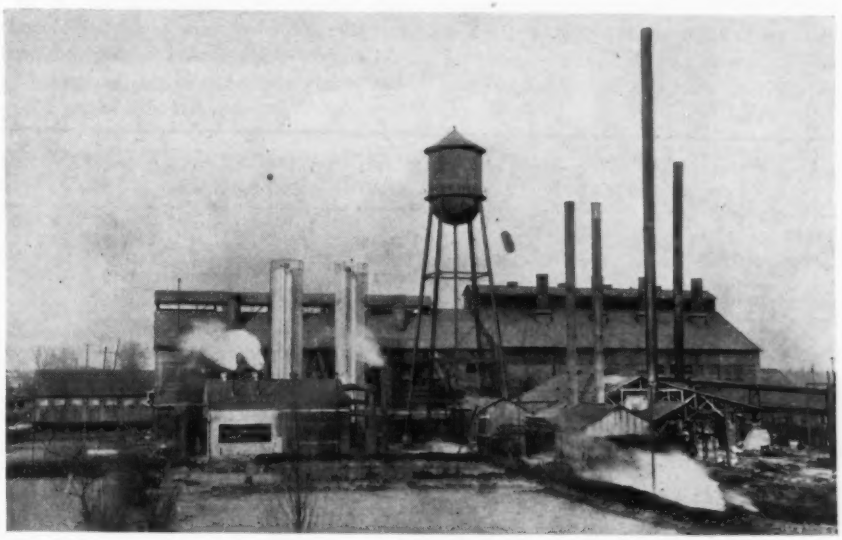
The development of new and better forms of carbon for industrial use which can be produced in quantity at reasonable costs is not an easy task. If it were there would be no present problem. While a great deal of work has been done and is being done on various phases of carbon, from a more or less cursory study of the literature we seem to know too little about the element carbon itself to enable us to understand why it behaves as it does under the various conditions of industrial use. Also we do not seem to know enough to enable us to convert one form of carbon to another more useful form, at least on a commercial basis.

Carbon in the form of coal, lignite, peat and wood is plentiful and cheap. Carbon from petroleum and natural gas is not so abundant or so cheap, but cheap enough to serve as sources of industrial carbon for many uses.

There are indications that with some study and research, both as to production methods and as to the product itself, wood charcoal, both hard and soft, can be produced more uniformly, more cheaply and in larger quantities than is now being done. If it can be made cheaply enough and in the right places geographically, perhaps wood charcoal production can not only satisfy present consumers but also to some extent expand into other uses.

If we could learn how to change the form of carbon so as to control physical and chemical properties we could solve our whole problem technically and go a long way toward solving it economically. For example, if we could make a calcined coke from wood charcoal which would have a true density of say 2.2 with volatiles and ash under 1% each, and which could be graphitized in electrode manufacture as readily as petroleum coke from a paraffin base crude, our technical problem of electrode carbon would be practically solved. Or if we could remove the ash from coal chemically and from the pure carbon product make a coke of the above type and do it at a low cost we would solve the problem both technically and economically.

The first step is to obtain a better understanding of the structure of solid carbons; the second step is to learn how to reproduce each form in the laboratory; and the third step is to learn how to do it commercially and economically. The basic raw materials are certainly abundant and cheap. With our present knowledge of the structure of matter, our new working tools such as the electron microscope, electron and x-ray diffraction apparatus, spectrographic apparatus, and improved methods of reading very high temperatures, this carbon problem does not seem insoluble.



Thermal black plant of Thermatomic Carbon Co., Sterlington, La.

NEW DEVELOPMENTS

Gas coke. Carbon in natural gas in the Southwest is available at a cost of about 1/5¢ per pound, or $4 per ton. Carbon black processes recover 5 to 30% of the available carbon. However, even the coarsest grades of carbon black are unsuited for most industrial carbon applications. The other costs of manufacture in addition to raw material cost bring the price of the cheapest furnace black up to $70 per ton. This price excludes carbon black from the major industrial uses other than uses as rubber reinforcing filler pigment for inks, protective coatings, and plastics.

One new product has been developed that is functionally more suited to such

large scale uses as electrode manufacture, steel carburization, carbon specialties, etc. This material, known as natural gas coke, is now available in experimental quantities in beaded form (about —10 +30 mesh) and closely resembles retort coke in physical properties. It is 99.5% pure carbon, about 0.2% hydrogen, and the remainder is largely sodium, potassium, magnesium, and calcium oxides or carbonates. Sulfur and phosphorous are present not at all or in trace only. Because of the high operating and fixed costs of recovering a portion of the approximately .035 lbs. of carbon present in a cubic foot of natural gas, this product will sell in the range of $50 to $150 per ton, depending upon the quantity produced. However, economies in its use—high purity, low volatile content, and bulk shipment and handling properties—will tend to offset the high price to some extent. For some uses, particularly where high purity is essential, cost may be a secondary consideration.

(2) The demand for roofing pitch and other types of specialty pitch is growing with the general increase in business.

(3) There is already a shortage of suitable pitch binders for various uses, so that if pitch is coked it would accentuate the shortage of pitch binders.

(4) The amount of metallurgical coke produced, which by and large controls the amount of tar produced, may not increase in proportion to the general industrial growth because of the use of pressure and/or oxygen enrichment in blast furnace operation. Both of these technological advances reduce the consumption of coke per unit of pig iron produced. The art of using coal as a source of industrial carbon was more highly developed in Germany prior to and during the war than it has ever been in this country.

TABLE VI—ANALYSES OF TYPICAL SAMPLES OF U. S. HARDWOOD AND SOFTWOOD CHARCOALS

Source	*Description*	*Moisture*	*Volatile matter*	*Fixed carbon*	*Ash*	*Tar, oz. per ton*	*Gross BTU. per lb.*
Mich.	Hardwood, lump	1.65	18.9	no data	no data	**0-10**	
Ark.	Hardwood, lump	1.78	16.5	78.1	3.6	0-10	
Penn.	Hardwood, lump	1.79	18.2				
	Hardwood, lump	4.0	25.0	69.8	1.2	0-10	
Fla.	Softwood, lump from modern plant with coolers	1.14	16.9	80.5	1.5	10-20	
Fla.	Softwood, lump from modern plant with coolers { Low volatile	Approx. 1.0	14-17.5	80-83.5 }	1.5av.	0-20	
	{ High volatile	1.0	20-24	73.5-77.5 }	1.5av.	10-40	13,970
Fla.	Softwood, lump from plant using water quench cooling	25.1	24.4	no data	no data	0.10	
Fla.	Softwood, fines from waste pile (outdoor storage), all figs. approx.	12.5	27.7	45	15	20-30	
Mich.	Hardwood, briquettes	2.0	17.5	76.7	3.75	10-20	12,744
Tenn.	Hardwood, briquettes	1.9	17.7	72.4	8.0	**0-10**	

FUTURE TRENDS

It has already been pointed out that production of petroleum coke may actually increase somewhat in the next few years. But, as has also been pointed out, the production of qualities suitable for use in many large industrial processes is not on the increase, but is decreasing. It seems inevitable, particularly in view of the petroleum supply situation, that there will be a trend toward coal as a source of industrial carbon of high purity. For example, selected coals having a low volatile, low sulfur and low ash can be deashed and calcined. A study of the secondary properties of the resulting carbon, such as of graphitization, will have to be made in order to direct such research to useful end results. More pitch coke may be made available from coal tar pitch, but the amount of additional carbon available in this form cannot be large for several reasons:

(1) The total amount of crude tar produced is small, so that if all of it were coked the amount of pitch coke would still be small compared to the market for industrial carbon.

Another source of industrial carbon could be obtained if the number of existing low grade hydrocarbon materials could be coked and purified to yield a suitable product. Samples of such materials are petroleum refinery acid sludges, petroleum refinery pitches, and tar and natural asphalt.

The continued application of coking in petroleum refining in specific areas is to be expected. These are the areas in which the relative demand for distillates and petroleum coke is so balanced that the highest return per barrel of oil is obtained from a coking operation. However, it should be emphasized that a high degree of stability for such operations can probably never be obtained until the price level of coke has been increased somewhat and stabilized at an increased level. Most refiners who prefer to coke in their normal operations are also equipped to produce heavy fuel oil instead of coke in case the coke market indicates such a change. If the users of petroleum coke could pay more for the product it would do much to stabilize their supply.

It is not logical to expect to obtain petroleum and carbon black from synthetic fuel operations. For example, in the manufacture of synthesis gas, from the refining of the liquid hydrocarbons produced by the Fisher-Tropsch synthesis and from the liquid hydrocarbons produced by coal hydrogenation, the prospects for any significant supplies of either petroleum coke or carbon black from either of these operations is not good even in the long range view.

Production of petroleum coke from shale oil is a distinct possibility but is, of course, dependent on production of substantial quantities of shale oil. If the economic situation adjusts in such a way that shale oil can be produced, it may be advantageous to refine it using a coking operation.

Pure carbon could be made cheaply and in enormous volume by utilizing the reaction $2CO \leftrightarrow CO_2 + C$. This reaction goes favorably to the right at moderate temperatures, i.e. in the range of 700-900° F. The reaction was studied by the Germans during the war as a possible source of carbon black. It was concluded that the carbon so produced was not suitable as a reinforcing pigment for rubber since it was contaminated with up to 5% of the iron catalyst used in carrying out the reaction. The major problems in utilizing this method of making pure carbon are the working out of reaction conditions to give economical operation and the determination of how to produce grades of carbon suitable for the various uses.

CONCLUSIONS

The conclusions to be drawn from this study are very simple. For the most part the users of industrial carbon will still have to rely on petroleum coke and charcoal for their raw materials for various processes or products. The reason for this is that apparently little research has been done on alternate sources of carbon, and until extensive research is carried out, little relief is in sight for the users of industrial carbon.

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THE CHEMICAL PANORAMA

NEWS OF THE CHEMICAL PROCESS INDUSTRIES IN PICTURES

PEOPLE

Robert Pflaumer, named vice president in charge of operations, American-Marietta Co.

Carl F. Prutton, recently elected director of research for Mathieson Chemical Corp.

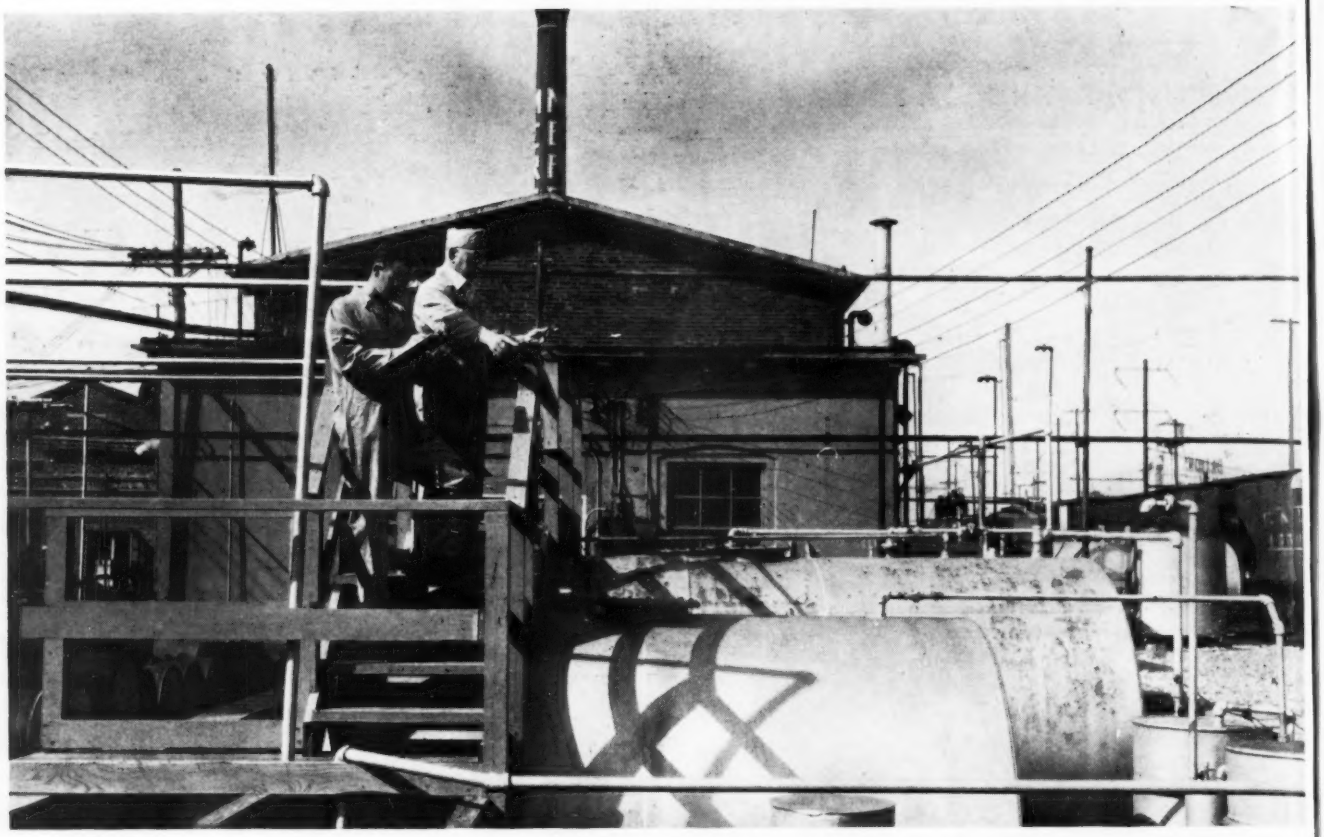
John J. Freeman, appointed technical director for the Neville Company of Pittsburgh.

Ronald B. Smith, elected to the executive engineering staff of the M. W. Kellogg Co.

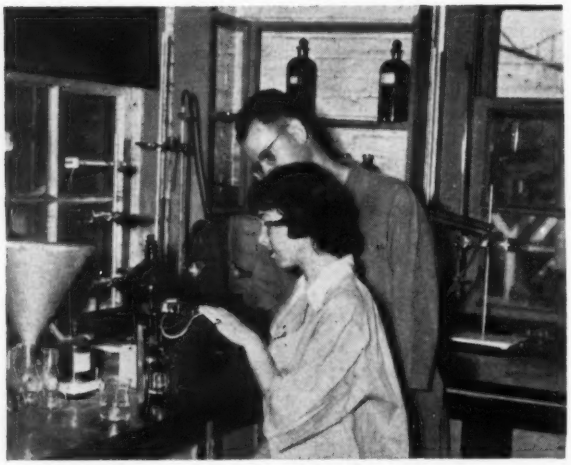
Nelson S. Knaggs, named divisional vice president, sales, Hilton Davis Co., Sterling Drug.

D. H. Wheeler, previously head of the Fats and Oils Section, General Mills Research Laboratories, named head of the organization's Chemical Research Department.

F. J. Hood, elected president of Ansul Chemical Company. He has been vice president since 1945.



Inventory is taken on a tank of phenobarbital intermediate. The production chemist works in many different parts of the factory.



A pH determination is checked to indicate the alkalinity of a sample of sewage. Lab work is part of the job.

Recorder charts and batch sheets which show the progress being made and the schedule for the day are studied.

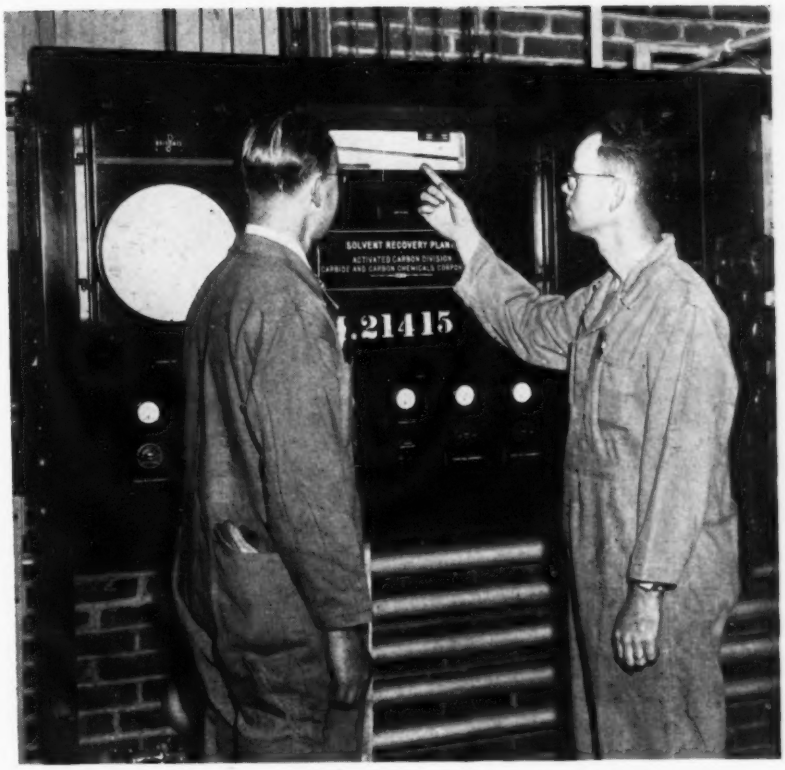
The schedule calls for examination of all materials. Here an intermediate is checked to make sure it conforms to physical specifications.

PRODUCTION CHEMIST

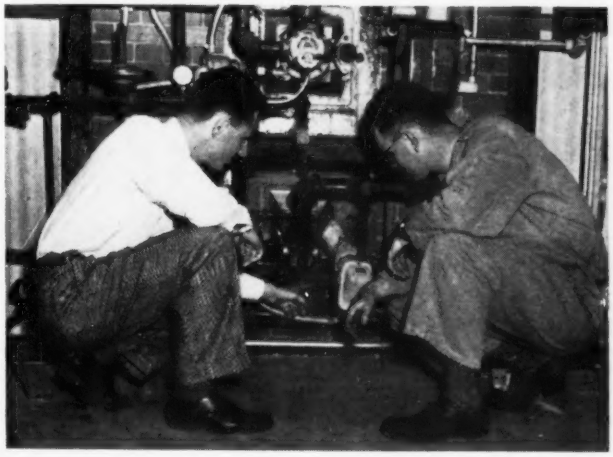
Charts, stills and test tubes are the production chemists' business. Operating at a level between department heads and foremen, they follow every phase of a process—planning in the offices, testing in the laboratories, and checking in the factories. Most of them are chemical engineers.

The work of a production chemist is extremely varied. Part of the job is to see that foremen get complete instructions on chemical and equipment operations from the department head, and to make sure that foremen and operators follow process procedures.

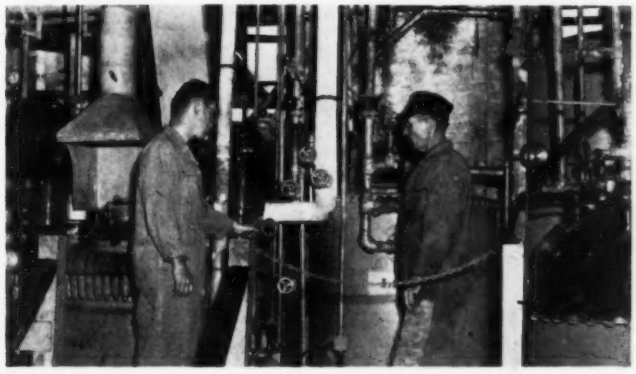
Here J. G. Greene, of Merck and Co., a typical production chemist, carries on with his job. He works on about a dozen products, involving four regularly scheduled chemical procedures, ranging from simple to complex syntheses.



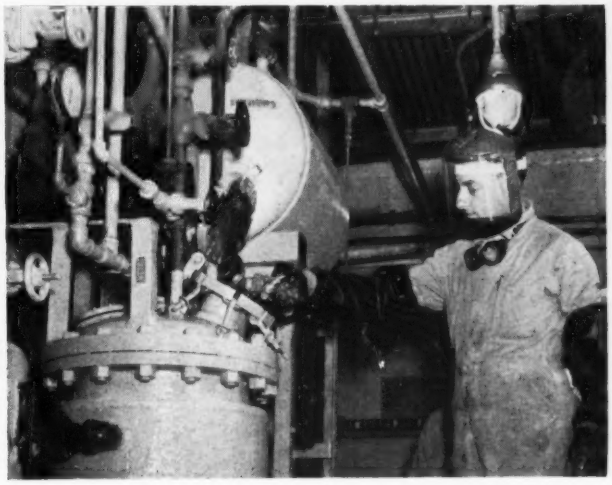
Production chemist and foreman read the instrument panel of an automatic acetone recovery unit. This unit sucks in and recovers acetone waste vapors.



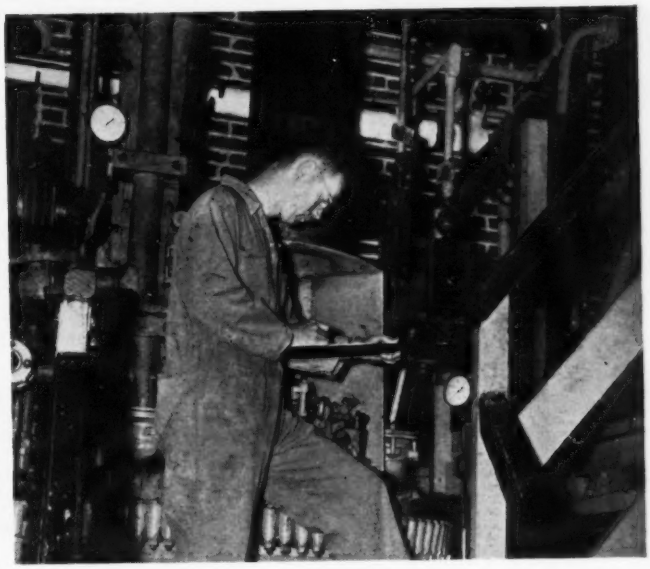
Another job is the inspection of new machinery. Here a new installation for waste solvent disposal is carefully looked over.



A minor repair needed on a valve is discussed. Machinery must be kept in good repair to prevent loss of material and production.



While a catalyst still is being charged, the production chemist supervises the safety precaution necessary for the operation.



The progress of a batch of ethyl bromide is noted by Chemist Greene during one of the regular checks on plant operations.

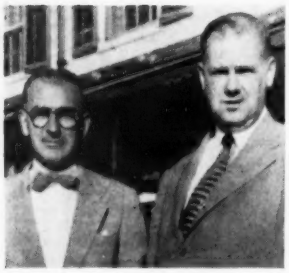
GOLFING SALESMEN

The largest turnout for a golf outing in the history of the 27-year-old Salesmen's Association of the American Chemical Industry was reported last month when the SAACI members gathered at the Montclair (N. J.) Golf Club for their fourth and final golf tournament of 1948.

Two hundred and thirty-five members and their guests were at the dinner and floor show, which terminated a day's activities marred only by a lack of caddies. One hundred and fifty-eight golfers played the course, with the last foursome finishing up by flashlight.

Low gross winners were R. W. Daniels, Calco; J. P. Remensnyder, Heyden; and Donald Calo, Niagara Alkali. Low net winners were Russ Boland, Drug Trade News; H. D. Robinson, Dow Chemical; and Paul Hiller, Innis, Speiden. Fred Neuberg of Enco won the Chemists' Club Trophy for the year.

Pictured at the right, top, are Dick Sheridan and Eric Johnson, General Chemical; Charles V. Douglas, Heyden Chemical (SAACI treasurer); Herbert Cornell, General Chemical; and Robert Milano, Millmaster Chemical. At the bottom are L. B. Thomas, Charles Pfizer and Co.; G. E. Garland, Shell Chemical; D. P. Jones, Shell Chemical; S. S. Coleman, Celanese Corp.; and Fred Buck, Ultra Chemical.



Left to right, Walter Johnson and Edward Ross, Columbia Chemical Division, Pittsburgh Plate Glass Co.; Bill Weed, Niagara Alkali Co.; Jack Conover, L. Sonneborn Sons; James G. Park, Enjay Co., president of the association; and Foster Smith of Merck and Co.

Jerome McGinity, Millmaster Chemical Co.; Philip J. LoBue, Philip J. LoBue Co.; Fred Johnson, the Barrett Division, Allied Chemical and Dye Corp., counting the funds he collected while ticket-taking; and Jack Seidler and Frank Smart of Whittaker, Clark and Daniels.

Jack Henry of Joseph Turner and Co., reading his score; William D. Neuberg, William D. Neuberg Co.; Walter Ballard, American-British Chemical Supplier Inc.; and John Glaze, Hooker Electrochemical Co., and Lou Bataille, Interchemical Corp., discussing the course.

The flameproofing of draperies, scenery, drop curtains and decorations in theaters, hotels, and other such public buildings is one of the major contributions made by the chemical industry for safer living. Today, phosphate of ammonia is generally recognized as the most effective flameproofing agent. Victor* Ammonium Phosphate is used extensively in industry for flameproofing textiles, paper, timber, and wood.

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NEW PRODUCTS & PROCESSES

Heat-Resistant Polystyrene NP756

A NEW HIGH heat-resistant, low-shrinkage polystyrene plastic, embodying three important characteristics not previously attained in material of this type, is now manufactured by the Chemical Division of Koppers Company, Inc.

The new plastic, called Koppers Polystyrene P-8, is expected to open new fields of use for this important material. Its special new qualities are thus enumerated:

1. It is the first high heat-resistant polystyrene that can be molded into a glass-clear product as well as in every color of the rainbow.

2. The new P-8 molds as easily as regular grades of polystyrene, whereas previous high heat-resistant polystyrenes have presented many molding problems.

3. When made in colors, the material shows great resistance to fading even when submitted to extended submersion in boiling water.

This new polystyrene plastic is made by an entirely different process. Koppers is able to produce and sell P-8 without charging a premium price. All previous high heat-resistant polystyrenes, said a company official, have been sold at a premium above the price of regular polystyrenes.

The new P-8 will not replace regular grades of polystyrene for many uses where no special resistance to heat is required, but rather it will open new fields of use for this plastic material.

Uses for which Koppers P-8 appears to be especially suited include the molding of knife and fork handles, funnels, tea strainers, and other household utensils which may be subjected to the scalding water of automatic dish washers; for bright-colored radio cabinets resistant to heat from radio tubes; in storage battery cases which must not shrink under the heat of operation; and in virtually all instances where crystal-clarity is desired in combination with high heat-resistance.

Left: old, right: new

Since polystyrene also has excellent electrical properties, production of this plastic with the added characteristics of Koppers P-8 offers excellent possibilities in the electrical field.

Controlled polymerization, to eliminate all traces of monomer, contribute to the special qualities of P-8.

Ethylene by Cracking NP757

The Socony-Vacuum Oil Co., Inc., has authorized the Vulcan Copper & Supply Co. of Cincinnati, O., to design and erect units developed by Socony-Vacuum to produce ethylene and additional basic materials for the chemical and other industries.

Known as Thermofor Pyrolytic Cracking, the process uses low-grade petroleum and residual oils. Ethylene has been obtained heretofore from petroleum as a by-product present in such low concentrations as to require expensive separation processes.

Officials of Socony-Vacuum and Vulcan predicted that construction of TPC ethylene facilities will assist in reducing costs of the ultimate products through increased supplies of the basic material.

The TPC process was developed by Socony-Vacuum at its laboratories in Paulsboro, N. J. It is essentially a high-temperature conversion accomplished without the use of a catalyst by contacting the oil charge with a moving bed of inert granules raised to high heat. This vaporizes the oil and induces rapid high-temperature reaction. The heat-transfer granules pass continuously through contacting and heating stages. The resultant mixture of unsaturated gaseous hydrocarbons consists primarily of ethylene.

The process is suitable also, according to Socony-Vacuum, for manufacture of certain aromatic hydrocarbon compounds.

Operation of the TPC units will be under licenses from Socony-Vacuum, arranged through the Vulcan Co. when construction of the units is authorized. In addition, Socony-Vacuum will extend appropriate research and advisory assistance to the licensees.

Pilot-Plant Titanium NP758

The Du Pont Co. has begun the small-scale manufacture of titanium metal.

A pilot unit of 100 pounds daily capacity has been successfully placed in operation at the Newport, Del., plant of the Pigments Department. This, so far as the company knows, is the first time ductile titanium metal has been produced for commercial exploration. The U. S. Bureau of Mines has been producing the metal for research purposes.

Du Pont is producing and offering it for exploration as a basic raw material for industry and engineering. It has many interesting properties, but exhaustive research will be needed to develop the full possibilities of titanium metal. When this work is done and if titanium alloys work out as expected, scientists believe they may have a new family of structural materials far superior in many ways to any metals or alloys now known.

Most titanium metal which has been

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Please send me more detailed information on the following new equipment:

NP 756	NP 761	NP 766	NP 771	NP 776	NP 781
NP 757	NP 762	NP 767	NP 772	NP 777	NP 782
NP 758	NP 763	NP 768	NP 773	NP 778	NP 783
NP 759	NP 764	NP 769	NP 774	NP 779	NP 784
NP 760	NP 765	NP 770	NP 775	NP 780	NP 785

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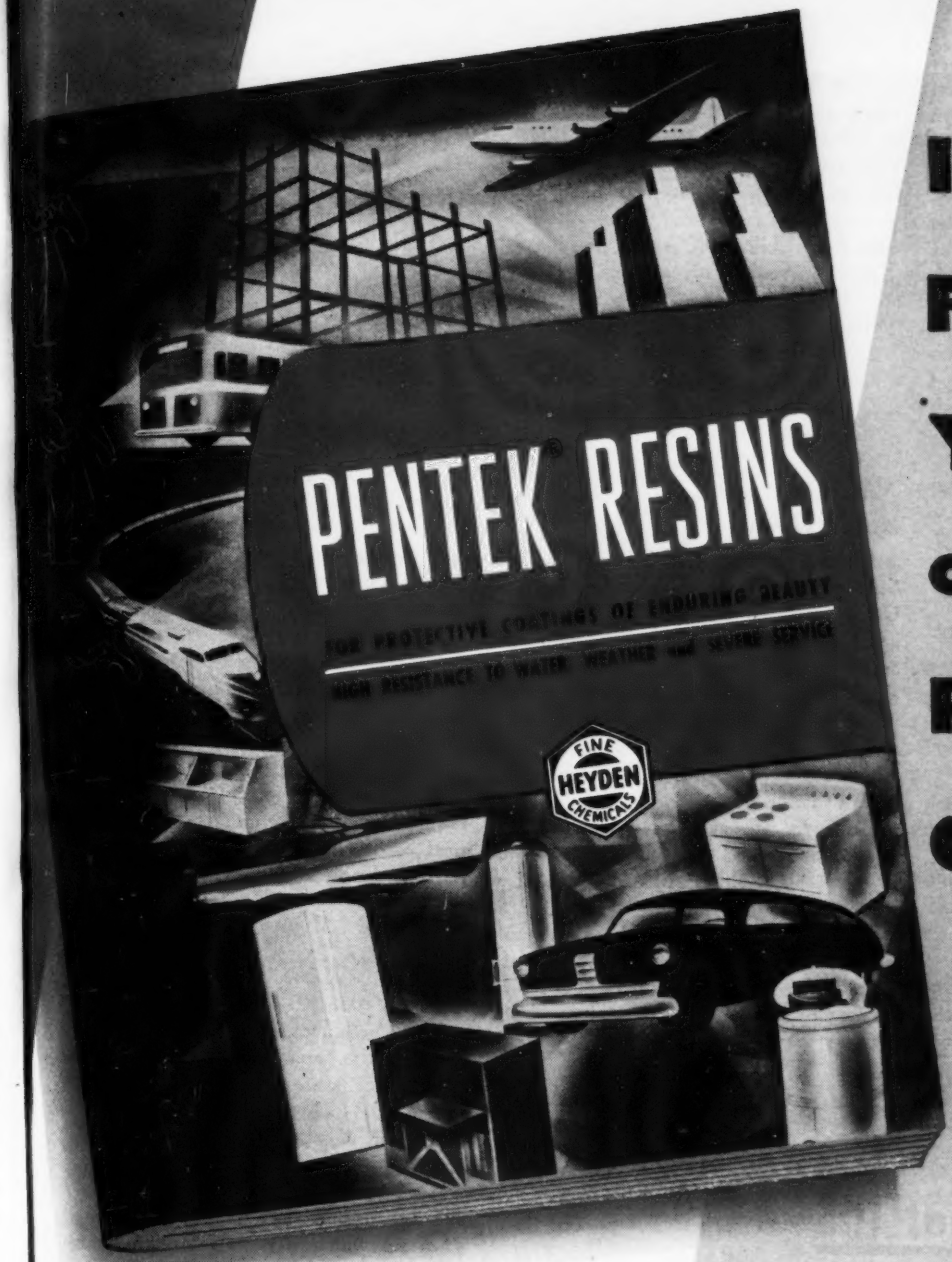

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available heretofore has been in powder form. Du Pont is producing it now in sponge form and will shortly be producing ingots weighing up to 100 pounds. Running 99.5 per cent plus of purity, the metal is ductile and can be rolled and drawn readily. It has high resistance to breaking or pulling and has high strength against distortion.

Present price of the Du Pont product is $5 per pound for quantities of 100 pounds or more in sponge form. Ingot prices will be set later. The company will supply small samples without charge to industrial and university laboratories for testing. As the process is improved and if demand warrants mass production of the new metal, the company hopes to be able to reduce the price sharply.

Modified Starches NP759

General Mills Special Commodities Division is offering two modified purified wheat starches with widespread applications in the food and confectionery industries.

Pending the selection of trade names, the starches will be known as A-22, a thick-boiling purified and modified starch of unusually high stabilizing power, and a B-24 series of controlled fluidity starches. They are the first of a complete line to come.

The A-22 is the result of a specially developed process that produces a starch of very high water holding capacity. It has a wide variety of uses, including that of thickener and stabilizer in homogenized baby food, as a fat emulsifier in soups, for pie fillings, in baked products such as wafers and cones, and as thickener and emulsion stabilizer in salad dressings.

The B-24 series of controlled fluidities are of especial interest to confectioners. They are preferred for high grade jellies and gum drops and have many other confectionery uses. Certain numbers of the B-24 series have applications in industrial fields.

New Line of Azoic Dyes NP760

A new line of dyes, Calconyl Double Solutions, has been introduced by the Calco Chemical Division, American Cyanamid Co. Calconyl Double Solutions are stabilized azoic dyes requiring acid aging, recommended especially for cotton printing but can be used on viscose. The new line of yellows, reds and scarlet display excellent brightness and economy in full shades.

Calconyls are said to produce heavy bright shades of very good fastness to light, washing, chlorine, perspiration, dry cleaning and hot pressing, and offer a wider range of shades in the same pattern than are obtainable when printing on naphthol-prepared material. They are satisfactory for use in patterns along with other acid aging types of dyes such as soluble vats or resin-bonded pigments.

Magnesium Brazing Process NP761

A satisfactory process for brazing magnesium was recently announced by The Dow Chemical Co.

All three of the commonly used brazing methods—furnace, flux dip and torch—are applicable to magnesium. A flux must be present to free surfaces from oxide or other films to permit capillary flow. For furnace brazing, the parts to be joined are assembled with preplaced brazing alloys, fluxed and heated to the proper temperature in a furnace. In flux dip brazing, the assembled parts are dipped in a molten flux bath. Torch brazing is similar to gas welding, except that little or no melting of the base metal occurs. It is accomplished by using standard gas welding equipment employing a neutral oxyacetylene or natural gas-air flame.

Magnesium brazing temperatures are between 1075°F. and 1160°F. Brazing of Dowmetal M magnesium alloy is practical on a commercial basis, but brazing for other alloys is in the experimental stage.

Water Purification Process NP762

The Philadelphia Quartz Co. has announced the issuance of a process patent on the purification of raw water. U. S. Patent 2,444,774 was granted recently to Harold R. Hay and assigned to the company.

This patent covers the company's N-Sol-A process of preparing activated silica sol which has been formed by reaction with ammonium sulfate or other salts of ammonia and dilute sodium silicate. This sol used in conjunction with a coagulant such as alum or iron salts produces rapid formation of large floc resulting in the removal of impurities from the raw water.

Further information is available on this development from the Philadelphia Quartz Co.

Synthetic-Resin Thickener NP763

Development of a synthetic, non-creaming thickener for natural and synthetic latex is reported by American Polymer Corp. Known as Polyco 296, this new product is based upon acrylate copolymers and can be diluted with hot or cold water to provide higher viscosities at lower concentrations than most commercial thickeners.

Because of its unique chemical composition, Polyco 296 is not subjected to the rotting, scouring and mildewing usually encountered with naturally de-

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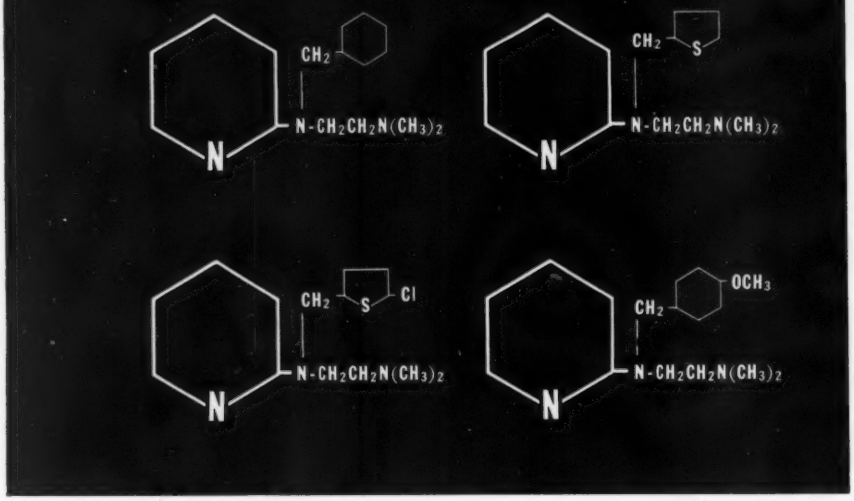
2-Aminopyridine

PARENT OF OUTSTANDING ANTIHISTAMINICS



The development of antihistaminics for relief in distressing allergic conditions, such as hay fever, is a substantial contribution of the pharmaceutical industry in the alleviation of human suffering.

The starting point in the synthesis of many of the outstanding antihistaminics, the structural formulae of which are shown above, is 2-Aminopyridine, a chemical of which Reilly is a principal producer.

In addition to 2-Aminopyridine, Reilly also produces 2,6-Diaminopyridine and four aminomethylpyridines, as follows: 2-Amino-3-Methylpridine, 2-Amino-4-Methylpridine, 2-Amino-5-Methylpridine and 2-Amino-6-Methylpyridine. The amino-methylpyridines are also of special interest in the pharmaceutical field, and are suggested as well for investigation in tthe manufacture of disinfectants, insecticides, plastics, rubber chemicals, wetting agents, additives to lubricants and gasolines, photographic compounds, dyestuffs, and in various organic syntheses.

Reilly 2-Aminopyridine and 2,6-Diaminopyridine are available in 98% purity. Reilly aminomethylpyridines are available in 95% purity.

Further information on any of these products gladly furnished on request.

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rived gums, proteins and starches. It will not support bacteria growth, is non-oxidizing, non-yellowing, stable in the presence of heat, and resists oils, fats, greases and aliphatic solvents.

Polyco 296 is recommended as an additive to thicken latices and resin emulsions for textile printing, pastes and sizes. It also may find wide use in the manufacture of lubricating greases, dipping, saturating and coating operations; as a flexible film former to render paper, leather and plastic films acid and oil resistant; and as a protective colloid for many types of emulsions and dispersions.

Ultra-Fine Alumina NP 764

Two high-purity alumina powders characterized by ultra-fine, uniform particle size, exceptional hardness and large surface area, are now offered in commercial quantities by Linde Air Products Co. These fine powders have already proven successful as ultra-fine abrasives in metallographic polishing. In view of their overall physical and chemical properties they show promise in optical and gem polishing, metal finishing, as ingredients in the manufacture of phosphors, and as catalyst carriers in chemical processes.

Both of these Linde powders have a high degree of purity (99.9+ % Al_2O_3), are unaffected by acids and by 30% NaOH at 80°C.

Type A-5175, alpha aluminum oxide, has a hexagonal crystal structure and a hardness of 9 on Moh's scale. Particle size is approximately 0.3 micron and the apparent density 4. The second powder of this class is Type B-5125, gamma aluminum oxide, having a cubic crystalline form, and a hardness of 8 on Moh's scale. Particle size is less than 0.1 micron, and apparent density 3.6.

Lactic-Based Acrylic NP 765

The manufacture of Lactoprene EV, a modified polyacrylic ester, is announced by B. F. Goodrich Chemical Co. This material is an experimental product developed by the Eastern Regional Research Laboratories of the U. S. Department of Agriculture. To be redesignated as Polyacrylic Ester EV, it will complement other nitrile and polyacrylic ester-type rubbers now being manufactured by Goodrich. At present it is available in pilot plant quantities only.

Adhesive NP 766

A new liquid plastic resin adhesive is designed to adhere white or colored cotton, rayon or wool flock to irregular surfaces, such as Christmas trees and branches of natural or artificial foliage. It is applied by hand brushing, spray guns or by dipping. The adhesive is dilutable

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The versatility of Ansul Liquid Sulfur Dioxide in industrial practices is illustrated by the following examples:

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SULFITES . . . . . SO_2
SO_2
SO_2
THIOSULFATES . . . . SO_2
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ANTICHLOR

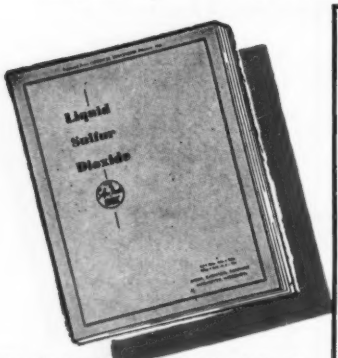
$$SO_2 + 2H_2O + Cl_2 \rightarrow H_2SO_4 + 2HCl$$

A typical use is in the Kraft Pulp industry . . . Sulfur Dioxide is essential to the production of a high-white bleached product. It improves brightness and prevents color reversion in pulp bleached by conventional chlorine and hypochlorite method. Here's why . . .

1. As an Antichlor, removes residual chlorine, preventing formation of oxycellulose compounds which yellow on aging.
2. Reduces colored ferric compounds to soluble ferrous state, easily washed from the pulp.
3. Changes pH to acid side, thus bleaching and brightening pulp.
4. Dissolves organic lime compounds which permits easy removal by washing.

You may have a similar or related use for Ansul Liquid Sulfur Dioxide in your plant. Let us demonstrate the economy and simplicity of an Ansul Fingertip Control System.

In addition Ansul Liquid Sulfur Dioxide is being currently used as a bleaching agent • purifier • preservative • solvent • fumigant • protective atmosphere in magnesium fabrication • refrigerant and in polymerization, etc.



Consult Ansul Technical Staff relative to the development of these and other applications for SO_2 in your processes.
Write for treatise on Liquid Sulfur Dioxide and request bulletins describing the specific application in which you are interested.

PHYSICAL PROPERTIES

Chemical formula	SO_2
Molecular weight	64.06
Color (gas and liquid)	Colorless
Odor	Characteristic, pungent
Melting point	−103.9° F. (−75.5° C.)
Boiling point	14.0° F. (−10.0° C.)
Density of liquid at 80° F.	(85.03 lbs. per cu. ft.)
Specific gravity at 80° F.	1.363
Density of gas at 0° C. and 760 mm.	2.9267 grams per liter (0.1827 lb. per cu. ft.)
Critical temperature	314.82° F. (157.12° C.)
Critical pressure	1141.5 lbs. per sq. in. abs.
Solubility	Soluble in water
Purity	99.9+% (by wt.) SO_2 (H_2O less than 0.01%)

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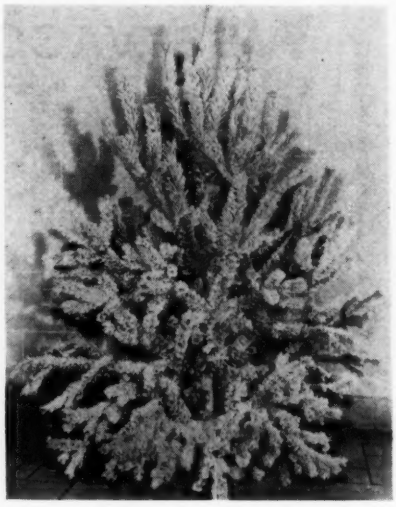
with water, the amount of dilution depending on the coating method employed. A few seconds after application, it forms a tacky film on the branches, the flock is then dusted or blown on the coated areas and the excess shaken off. When finally dry, the adhesive holds the flock with a flexible and non-crystallizing bond. The adhesive is available in white (natural), red, blue or green colors, and the manufacturer is equipped to supply special colored tints on order.

One of the most popular uses of the adhesive is in preparing "snow" covered Christmas trees for holiday decorations in



homes, department store window displays, hotel, bank and theater lobbies, florists' shop windows and similar locations.

The manufacturer, Paisley Products, Inc., offers Paisley Flock Cement #3125 in quart, gallon, 5 gallon and 55 gallon drum packings.

Antiseptic Coating For Metals NP 767

Benzol Products Co. has developed a novel process (patent pending) for producing antiseptic metal surfaces, notably on aluminum, magnesium, zinc and tin. Bacterial and fungal growths, which often occur on the metal surfaces of food, cosmetic and pharmaceutical containers and closures, on optical equipment such as cameras, binoculars, and range finders, and on metal articles and structural parts used in the food, drug, beverage and other industries, are effectively arrested by this method of treatment.

To create the antiseptic coating, the metal surface is first oxidized either electrolytically or chemically and then simply immersed in a solution of 8-hydroxyquinoline or one of its salts. Colored antiseptic coatings may be produced by the addition of dyes to the 8-hydroxyquinoline solution. A one-step method of oxidizing and rendering metal surfacer antiseptic is also possible.

Photomicrographs of the treated metal show that there is an actual chemical

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This latest member of the Ultrawet group was developed especially for drying operations. It is a slurry, pumpable at ordinary temperatures, that contains 35% solids of which a minimum of 90% is active alkyl aryl sulfonate.

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Ultrawet 35K is ideal for either spray or drum drying. Available in tank-car and tank-truck lots.

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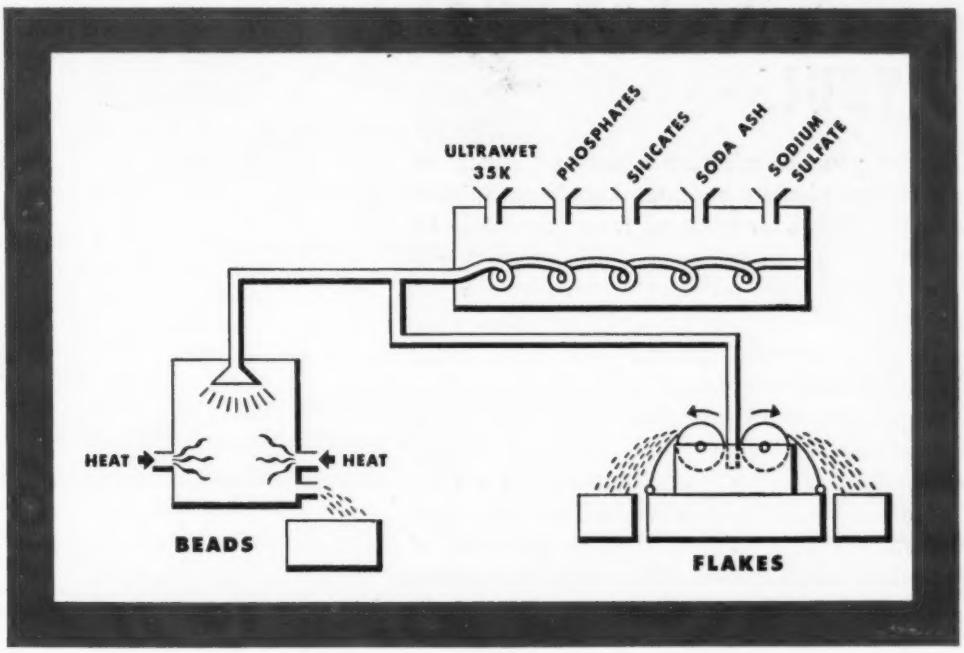

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. . . and for nurses and medical attendants and others who minister to the sick. And we've done it for the patients themselves in helping to lessen their discomfort. For in the course of certain ills there sometimes develop highly offensive odors. To alleviate such odors is to improve the sickroom conditions for the patients as well as the working conditions for those attending to their ills. Our laboratories have developed aromatic deodorants that accomplish this most effectively and economically. As harmless as any perfume, these aromatics mask unpleasant odors by giving the sickroom atmosphere a freshly cleaned effect. But sickroom odor control is just one of the hundreds of deodorizing problems we have solved. What now concerns us are the problems we *haven't* solved. Maybe *yours* is one of them and . . .

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Let's assume you manufacture a product which retains a rather unpleasant residual odor in its finished state and that this odor tends to retard its sales. Or let's put it another way: Suppose this product possessed a faintly *pleasant* and *appropriate* odor. Wouldn't this subtle quality tend to help rather than hinder its sale? Countless products sell better today because undesirable residual odors have been eliminated or because substitute fragrances have given them added appeal. Plastic articles, synthetic rubber, leather, linoleums, paints, printing inks and a wide range of other commercial products have been improved from a selling point of view by the work of our Technical Laboratories. They will be glad to work on similar problems for *you.*

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combination of 8-hydroxyquinoline with the oxide coated surfaces. The coating fully retains its antiseptic characteristics over a period of years.

•

Phenolic-Rubber Molding Powder NP 768

A new Hycar-phenolic molding powder which will provide high shock resistance characteristics to instrument cases, knife handles, power tool handles, and a variety of other applications which undergo rough treatment, has been developed by the Compound Division of General Electric Co.'s Chemical Department. The new compound possesses the good moldability and heat resistance of wood-flour filled phenolics and is strengthened by

the toughness and resiliency of Hycar-American rubber, a product of B. F. Goodrich Chemical Company, to the point where it can replace cotton flock and rag-filled compounds for many applications.

Certain tests of the new compound, designated G-E 12446, indicate that its resistance to impact is many times more than that of standard wood-flour filled phenolic materials. It possesses low bulk factor, excellent powder pourability, provides good finish, and can be rapidly preformed in automatic equipment. The compound can be molded into complex parts by either compression or transfer methods in molds designed for ordinary wood-flour filled phenolics.

An additional feature of G-E 12446 is its excellent thermal shock resistance which permits molded parts to be subjected to an instantaneous drop over a wide temperature range without cracking.

Aluminum Brightening NP 769

By means of a new chemical development, aluminum may be made as bright as mercury.

A galvano-chemical process has been developed by the Philadelphia Rust Proof Co. At present, the work is being done in its own plant on a jobbing basis, until patents applied for have been granted and certain technical difficulties ironed out. Licenses may be issued later.

Reflectors spun of aluminum and Lustrik-brightened retain their lustre and

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If you use Lead Salts in your manufacturing or processing—remember Baker is in a unique position to supply your needs. Here are three Baker Sales Leaders known for uniform quality.

LEAD NITRATE TECHNICAL

Baker's Lead Nitrate comes to you month after month in fine crystal form, chemically uniform and non-packing. The color is white. A special Baker process makes possible the exceptionally high purity in regard to iron.

LEAD ACETATE TECHNICAL

Baker's Lead Acetate Technical is available in five physical forms: crystal, small crystal, coarse powder, granular and powder. Sizes of large crystals are: 1" to 1½" on the average; small crystals are ½" and less. Baker's Lead Acetate is colorless and free-flowing. It is exceedingly low in **Cl, NO_3, Fe and Cu.**

LEAD PEROXIDE TECHNICAL assay 88½ to 90½%

Baker's Lead Peroxide Technical is a fine powder and very uniform in texture. The color is also exceptionally uniform being a light chocolate shade. Where a low water soluble material is required this product has wide appeal.

Samples and prices on any one or all three Lead Salts will be gladly forwarded upon request. Address your letter direct to J. T. BAKER CHEMICAL CO., *Executive Offices*, Phillipsburg, N. J.

Baker's Chemicals

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CRESYLIC ACID

TRICRESYLPHOSPHATE

TRIPHENYLPHOSPHATE

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VALERATES
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do not smudge or fingermark. If added protection is desired, they may be anodized with little diminishing of reflectivity.

The Lustrik process appears also to have value in plating on aluminum, painting on aluminum and dyed anodic coatings.

Floor Drying Compound NP 770

Reduced maintenance costs, increased safety and improved working conditions are the key advantages of a new product, Industrial Floor-Dry, introduced by The Eagle-Picher Co.

Eagle-Picher Industrial Floor-Dry is a relatively hard, granular material, possessing remarkably high absorptive properties for oil, grease and water drippings.

Industrial Floor-Dry is of particular interest to plant safety engineers because it does not become slippery or soggy when saturated.

Industrial Floor-Dry is available in 50-pound paper bags, from warehouses throughout the country.

m-Nitrobenzotrifluoride NP 771

Hooker Electrochemical Co. announces pilot-plant production of *m*-nitrobenzotrifluoride (*m*-nitrotrifluoromethylbenzene). It is of particular interest as an intermediate in the preparation of dyestuffs and other fluorine containing compounds.

m-Nitrobenzotrifluoride is a pale straw colored, oily liquid possessing an aromatic odor. The CF_3 group is stable to further chemical reaction. The NO_2 group may be reduced. The product is also subject to further nuclear substitution. A typical ASTM distillation range is 200.5° to 208.5°C; freezing point is —5.0°C.

Cryolite Process NP 772

A new process, which will lead to lower cost aluminum, has been developed by the Aluminum Company of America. It is used in the production of cryolite, a necessary material in the electrolytic reduction of aluminum ore to the metal.

The new process avoids high temperatures and the use of a highly corrosive gas, hydrogen fluoride. The unavoidable evolution of hydrogen fluoride, in current practice, requires expensive replacement of equipment destroyed by corrosion, and high-cost materials of construction to withstand the corrosive attack of the gas.

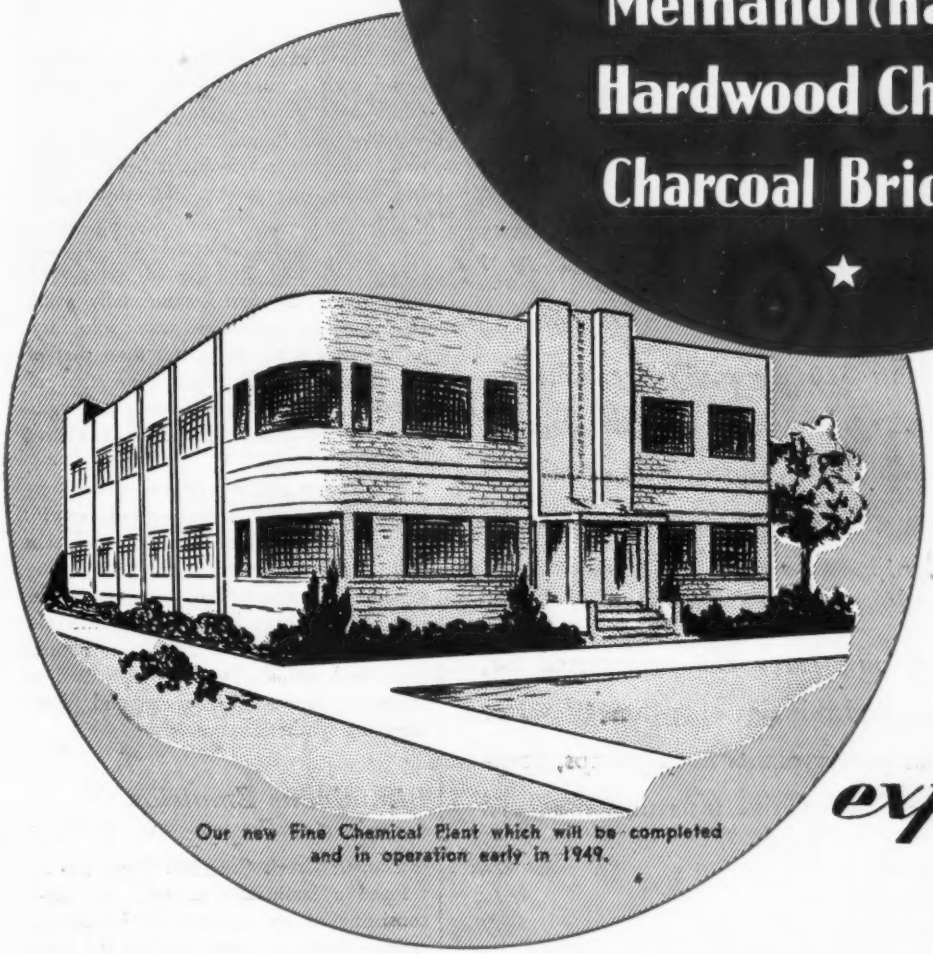
Also advantageous in that it does not require high-purity fluorspar, it can utilize fluorspar containing appreciable amounts of silica. Present practice requires fluorspar low in silica, and since sources of high-purity fluorspar have become nearly exhausted, it is necessary to use costly methods of purification.

Called the "Fluoboric Acid Cryolite

producing

Acetic Acid
Muriatic Acid
Sodium Benzoate, U.S.P.
Benzaldehyde, technical and N F
Cinnamic Aldehyde
Methanol (natural)
Hardwood Charcoal
Charcoal Briquettes

★



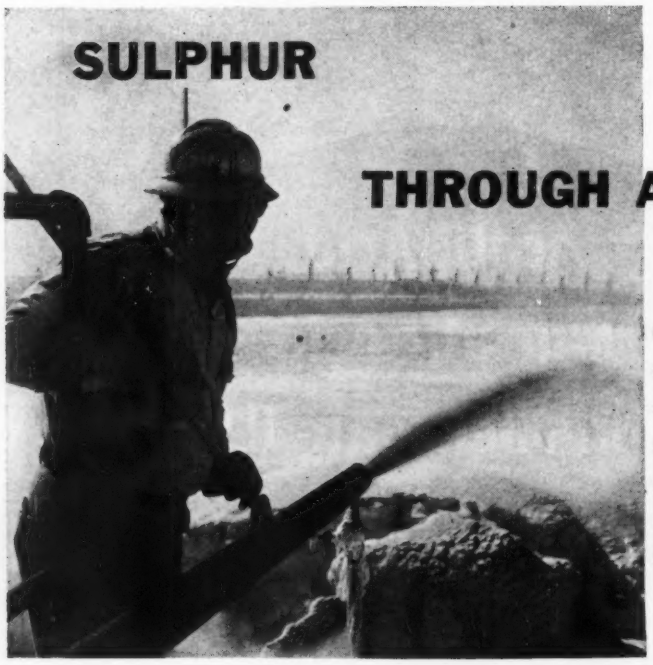
Our new Fine Chemical Plant which will be completed and in operation early in 1949.

expanding

Tennessee Products & Chemical Corporation

General Office: NASHVILLE, TENNESSEE

Eastern Sales Office: 350 Fifth Avenue, New York 1, N. Y.



Molten Sulphur is sprayed into a storage vat at the Grande Ecaille property of Freeport Sulphur Company in Louisiana.

One of a series of Stories of Sulphur

SULPHUR is mined through a pipe. On the Gulf Coast Sulphur is mined not as solid but as liquid; not by pick and shovel but by superheated water. Sulphur men use water and pipes and air pressure for tools and learn from instruments about the deposits they never see.

HEATED under pressure to 320 degrees Fahrenheit, the water is piped down hundreds of feet to melt the Sulphur in its underground deposit. Molten streams of yellow mineral are forced to the surface, and still glowing are poured into the storage vat to cool and harden.

THOUSANDS of feet of pipe carry the compressed air, water and molten Sulphur and millions of gallons of water are used in the process. Great power plants keep pumps, compressors and boilers operating and sensitive instruments record temperature and pressure.

FREEPORT SULPHUR COMPANY

OFFICES: 122 East 42nd Street, New York 17, N. Y.

MINES: Port Sulphur, Louisiana • Freeport, Texas

SULPHUR SERVES INDUSTRY

Process," the new method makes use of a mixture of sulfuric and boric acids which reacts with the fluorspar to form fluoboric acid. This reaction proceeds at moderate temperatures in an open system and without the evolution of corrosive fumes. The fluoboric acid is then allowed to react with soda ash and aluminum oxide to form a high purity cryolite.

New Glycols NP 773

Carbide and Carbon Chemicals Corp. has announced commercial production of three new glycols: butanediol-1,3; 2-methylpentanediol-2,4; and octylene glycol.

This is the first commercial production in the United States of butanediol-1,3. It is a mild-odored, colorless liquid, miscible in all proportions with water and alcohol. It is less volatile and more viscous than its lower homologs, ethylene glycol and propylene glycol. The hygroscopicity of butanediol is about 60 per cent that of glycerol and three times that of octylene glycol. Its derivatives are less water-soluble and more soluble in hydrocarbons than those of ethylene glycol.

2-Methylpentanediol-2,4 is a colorless liquid with a mild hygroscopicity, retaining a constant moisture content over a wide range of humidity. It is miscible with water; the lower alcohols, ethers, ketones and esters; chloroform; and ethylene dichloride.

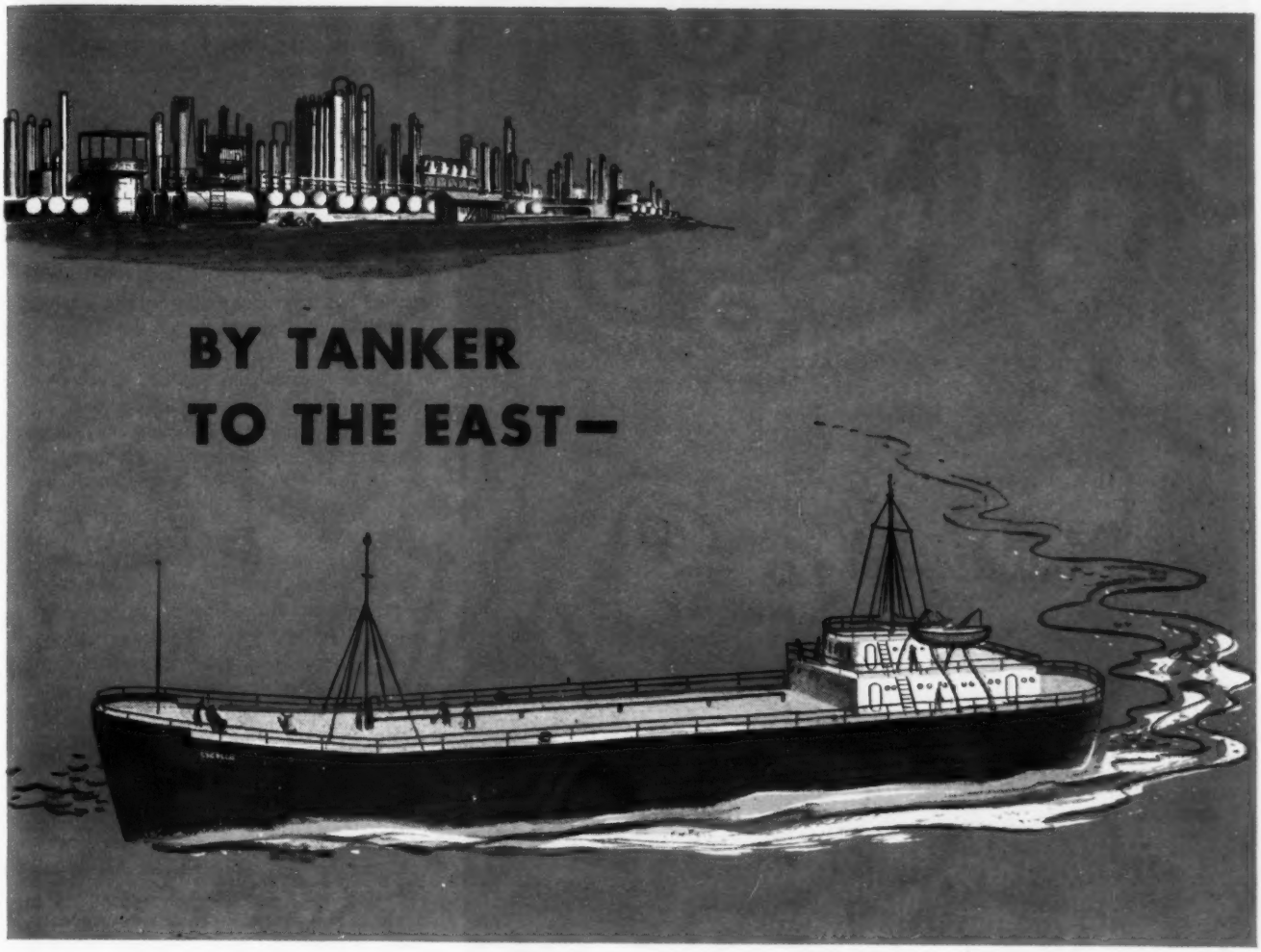
Octylene glycol is a colorless, 1,3-diol of low volatility and limited water solubility. It is the first commercially available glycol having limited water solubility. Its viscosity is much greater than that of the lower diols, but less than that of glycerol. It is about one-tenth as hygroscopic as glycerol at 65 per cent relative humidity and at 21° C.

These new glycols are good plasticizers and softeners for animal glues, casein, cork, gelatin, polyamide resins and zein compositions. They are useful as coupling or blending agents for cosmetic creams and metal cutting, leather and textile oils, and as solvents for essential oils, natural gums and resins. They are also used as intermediates for alkyd resins and plasticizers for synthetic resins.

Bituminous Emulsion Laminates Paper NP 774

Coopers Creek Chemical Corp. has developed a laminating material for paper consisting of an emulsion of bituminous resins, which, moreover, renders the paper waterproof. The dried emulsion film is impervious to greases, petroleum oils, acids, alkalis, and salts; and is exceedingly flexible. The emulsion contains a minimum 50% solids.

Especially designed for paper bag manufacture, the new product is expected to permit multiwall bag makers to laminate two sheets of paper together and



CELANESE* FORMALDEHYDE

Supplementing nation wide deliveries of Celanese Chemicals by rail from the Chemcel plant at Bishop, Texas, Celanese is now operating the first tanker facilities for the shipment of formaldehyde. This new service provides eastern industries with additional quantities of both inhibited and uninhibited grades of this important basic commodity.

From new Celanese storage facilities at Corpus Christi, Texas, a tanker is now regularly carrying formaldehyde eastward to New Haven, Connecticut in specially insulated stainless steel compartments. From the New Haven terminal, with a storage capacity of more than 7,000,000 pounds, Celanese offers prompt deliveries of formaldehyde to Eastern consumers.

During every step of the way—from Chemcel to your plant door—the quality of Celanese* Formaldehyde is maintained at USP standards. A well equipped control laboratory at the New Haven terminal assures deliveries of the highest quality product.

CELANESE CORPORATION OF AMERICA
Chemical Division
180 Madison Avenue, New York 16

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Mines: Newgulf and Moss Bluff, Texas

produce a bag equally as strong, more waterproof, and more resistant to chemicals than (for example) a five-ply bag using no laminant.

Petroleum-Based Plasticizer NP 775

Development of "S/V Sovaloid A Special" as a highly-efficient plasticizing oil for many compounds of natural rubber, Neoprene and GR-S (Buna-type synthetic) has been announced by the Chemical Products Department of the Socony-Vacuum Oil Co.

The new petroleum product, which has a bright, clear, amber color, is said to be more resistant to discoloration than any other general-duty plasticizer now in use in the rubber industry and produces tight, snappy vulcanizates with excellent aging qualities.

"S/V Sovaloid A Special" has a comparatively low viscosity and pours freely at below-zero temperatures. It is being produced in the Socony-Vacuum refinery at Paulsboro, N. J., and is available in reasonable volumes.

Polystyrene Adhesive NP 776

A new adhesive for bonding polystyrene either to other pieces of polystyrene or to paper, cardboard, fabric, glass, rubber, and certain other plastics has been developed by the Koppers Co. Although it is a polystyrene solvent, its solvent power is controlled so that etching, which weakens the plastic and mars its appearance, is minimized and molding stresses in the polystyrene are relieved before they can cause cracks, as it has a relatively slow evaporation rate. The adhesive has quick initial set, produces clear, bubble-free bonds of great strength, and in dry assembly can be applied with a small brush, a hypodermic syringe, or an eye dropper.

Safety Floor Finish NP 777

A new safety floor finish, Traffic-Tred, a product of the Watson-Standard Co., is an abrasive floor coating which is applied like paint. It dries to a hard, rough surface with a texture much like coarse sandpaper and works equally well on steel, wood or concrete, removing most of the danger from walking areas subject to dampness, greasiness and other slippery conditions.

Vinyl Varnishes NP 778

The Alkydol Laboratories have developed a series of copolymerization products of vinyl compounds with fatty oils which compared to styrene varnishes exhibit a higher viscosity at lower concentrations, paler color, greater film hardness and better brushability. Enamels formulated

ALKANESULFONIC ACID*

Now in full commercial production

* Mixed methane-ethane-propane-sulfonic acid

A STRONG NON-OXIDIZING NON-SULFONATING ACID

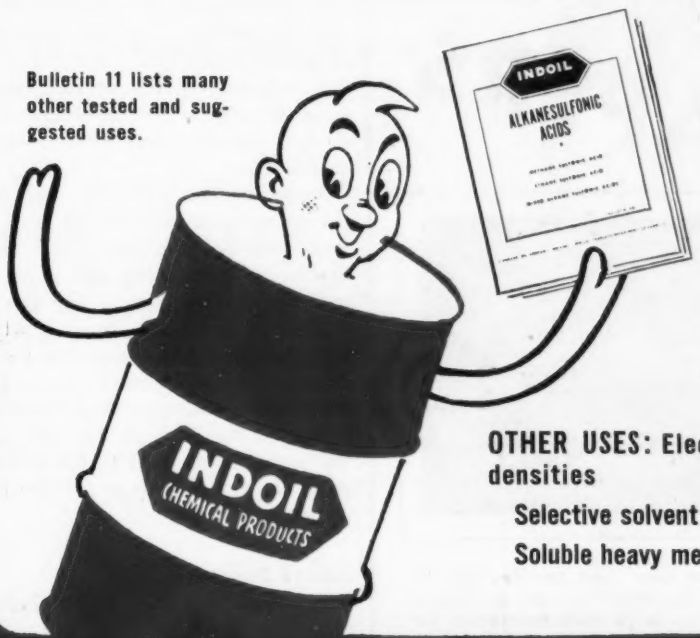
TYPICAL REACTIONS: With phosphorus trihalides forms alkanesulfonyl halides

With olefins forms alkyl alkanesulfonates

With aromatic hydrocarbons forms sulfones

With metal bases and carbonates forms highly water soluble salts

Bulletin 11 lists many other tested and suggested uses.



USES AS CATALYST:

Polymerization of olefins

Alkylation of aromatic compounds with olefins

Esterification and ester exchange

Etherification of alcohols and mercaptans by olefins

Condensations of numerous types

OTHER USES: Electrodeposition at high current densities

Selective solvent for NO_2, olefins, etc.

Soluble heavy metal salts

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with these vinyl varnishes have excellent gloss and gloss retention, and high color stability in the light as well as in the dark. They possess good water and alkali resistance.

Dust Sticker NP 779

Colloid Products Corp. has developed a product which makes agricultural dusts freer-flowing and heavier so that they settle faster. Excellent retention and lower weathering losses are also claimed.

Mildew Preventative NP 780

For addition to paints to prevent mildewing, Mer-Q-Ree, Inc. is marketing a product containing 20% mercury compounds. The product has been found to be an effective mildew toxic. It may be used in interior paints providing a food poison hazard is not present.

Surface Active Agent NP 781

A new agent, marketed under the name Sulframin AB Concentrate by the Ultra Chemical Works, is a very highly concentrated dodecyl toluene in small flake form. Among its features are its high concentration and resistance to acids and alkalis.

Thickened Fuel NP 782

The application of thickened fuel as an industrial product to aid power generation, was reported by Esso Standard Oil Co. The product is a fuel igniter made of thickened diesel oil that will fire stoker-fed industrial boilers to full operating steam pressure in 30 min. compared with 8 hrs, usually required by wood and coal kindling.

Employing an aluminum soap as the thickening agent, the material has a semi-fluid, jelly-like consistency and can be applied in nests along the boiler grate well in advance of use. The thickened fuel clings to the coal, burns slowly and with sufficient intensity to fire the coal. Its ability to fire the entire furnace evenly contributes to the speed with which steam pressure is obtained. In tests, five gals. of the product were used to fire boilers capable of producing up to 500,000 lbs. of steam per hr.

Ethyl Silicate Progress NP 783

Sharp reductions in royalties for investment casting with ethyl silicate as a mold binder have been announced by Carbide and Carbon Chemicals Corp. The company also announced successful operation of a new process for making commercial quantities of a condensed ethyl silicate that is uniform in composition and low in color.

At the same time, the Carbide labora-

(*Turn to page* 672)

Mallinckrodt
SILVER SALTS
for industry

SILVER NITRATE

SILVER CYANIDE

SILVER OXIDE

are made only from carefully selected

SILVER BULLION

Acceptance of **Mallinckrodt Silver Nitrate** for the exacting manufacture of photographic films and silvering of mirrors indicates its supreme quality better than any specifications could. **Mallinckrodt Silver Nitrate** is so pure that it is light-stable. The foreign heavy metal content is so low that a whole carload contains only about one cubic inch.

The same fine raw material, the same skillful processing, the same high standards give all **Mallinckrodt** silver salts this same ***uniform, dependable purity.***

Silver compounds for Industrial, Photographic, Medical and Analytical Uses

Silver Metal A.R. Precip.	Silver Acetate
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Silver Chloride A.R.	Silver Cyanide
Silver Iodide	Silver Lactate
Silver Nitrate C.P. Crystals	Silver Nitrate A.R. (A.C.S.)
Silver Nitrite	Silver Oxide U.S.P. IX
Silver Protein Mild U.S.P. XIII	Silver Protein Strong N.F. VIII
Silver Sulfate	Silver Sulfate A.R. (A.C.S.)
Lunar Caustic U.S.P. XIII (No. 1)	Lunar Caustic No. 2

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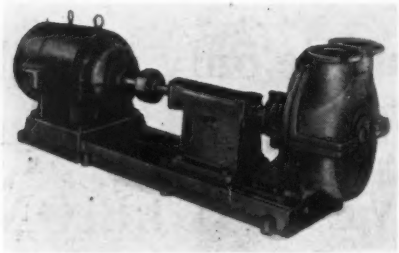
UNIFORM, DEPENDABLE PURITY

NEW EQUIPMENT

Stoneware Vacuum Pump QB 633

General Ceramics Co. is now producing a chemical stoneware vacuum pump of the rotary seal type. It is believed to be the first time this construction has been produced in this country.

Its entire "wet end" is of armored chemical stoneware and it will take any



type of sealing fluid or gas with the limitations noted below. It is built to handle corrosive gases (with the exception of hydrofluoric acid and caustic alkalies) under positive and negative pressures up to a full atmosphere for vacuum and two atmospheres for pressure.

The pump is at present furnished in a 2½" size only, but very shortly will be available in 1½" and 3" sizes. Direct or belt drive as desired can be had on all sizes and stoneware separators and cooling coils will also be furnished.

Gate Valves QB 634

The new line of union bonnet 600-lb. cast-steel gate valves of the Crane Co. designated No. 3602XW and 3602X, will replace the No. 3606XW and 3606X, which are being discontinued. The new valves are available in sizes ¼ through 2" with screwed ends and with two kinds of trim. The 3602XW has Exelloy seats and a hardened stainless-steel disc; the 3602X has both seats and disc of Exelloy.

In sizes ¾ through 2" the bonnet ring, bonnet and yoke are separate parts; from ¼ through ½" these parts are cast in one piece. The joint between the body and bonnet is sealed with a soft iron gasket, which is not affected by high temperatures. The valve has an outside screw and yoke. The stuffing box is deep enough on valves over ¾" to hold six rings of square packing. The gland is held by two T-head bolts fitted into slots in the yoke and can be adjusted.

The XW valves are recommended for superheated or saturated steam, hot or cold water, ordinary air, natural gas, fuel oil, gasoline, low-viscosity oil such as is used in hydraulic systems, butane, propane, and for fluids that are non-lubricating and relatively non-corrosive; up to 850° F. The X valves are recommended for oil and oil vapor up to 1000° F.

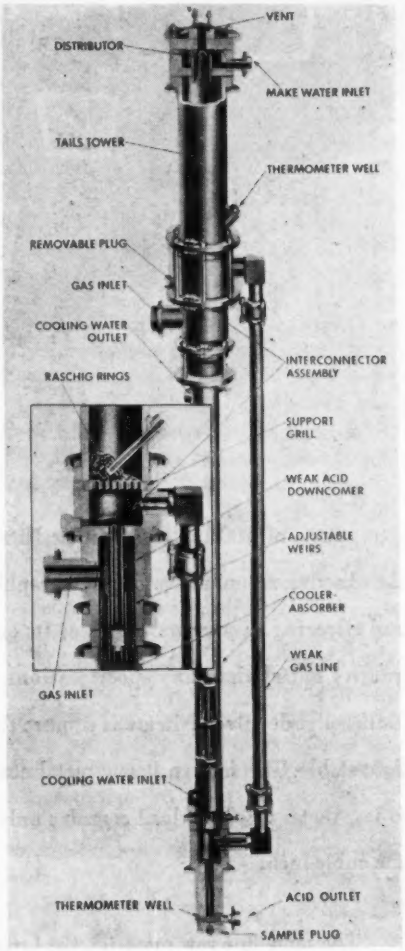
Photoelectric Counter QB 635

The new Photoswitch photoelectric counter is a general purpose unit for installation on any conveyor system or automatic machine for selective counting by height and length. The light source supplied with the equipment has an adjustable lens system which permits narrowing down the light beam for counting very small objects. The speed of operation is up to 600 counts per min. and the maximum number of counts is 99,999.

Falling Film HCl Absorber QB 636

National Carbon Co., Inc., is now producing falling-film type hydrochloric acid absorber, Model 6B. The new packaged unit produces 2¼ to 16 tons of acid per day. In the new absorber the gas and liquid streams flow co-currently in the first stage and counter-currently in the second. The company states that it is the most effective absorber yet made for gases in the range of 40% to 100% HCl by volume.

The new unit, which can make its own weight of 21 deg. Bé acid in less than 25 minutes, is only 21½ ft. high, occupies a floor space of 2' 11½" x 4'2⅝". The range of application can be extended by connecting two or more units in parallel.



Dust Collector QB 637

The new 30,000 cfm Centri-Merge swirl type stainless steel arrester of Schmieg Industries, Inc. is used to remove dust and dirt from shakeout stations, sand handling and conditioning systems. Sludge disposal is by a skid on a lift truck. The conveyor drive is on top of the conveyor spout. The unit features compact design and longer, corrosion-free operation.

Induction Coil QB 638

The new coil built by Ajax Electrothermic Corp. generates heat in the metal shell of autoclaves up to 4' dia. by electric induction. Operating temperatures up to 750° F. are automatically controlled. Advantages of this method are the uniformity of results, automatic electric control, and the fact that all the heat is

CHEMICAL INDUSTRIES TECHNICAL DATA SERVICE

CHEMICAL INDUSTRIES, 309 W. Jackson Blvd., Chicago 6, Ill. (10-8)

Please send me more detailed information on the following new equipment:

QB633	QB636	QB639	QB642	QB645	QB648	QB650
QB634	QB637	QB640	QB643	QB646	QB649	QB651
QB635	QB638	QB641	QB644	QB647	QB650	QB652
						QB653

Name .....(Position).....
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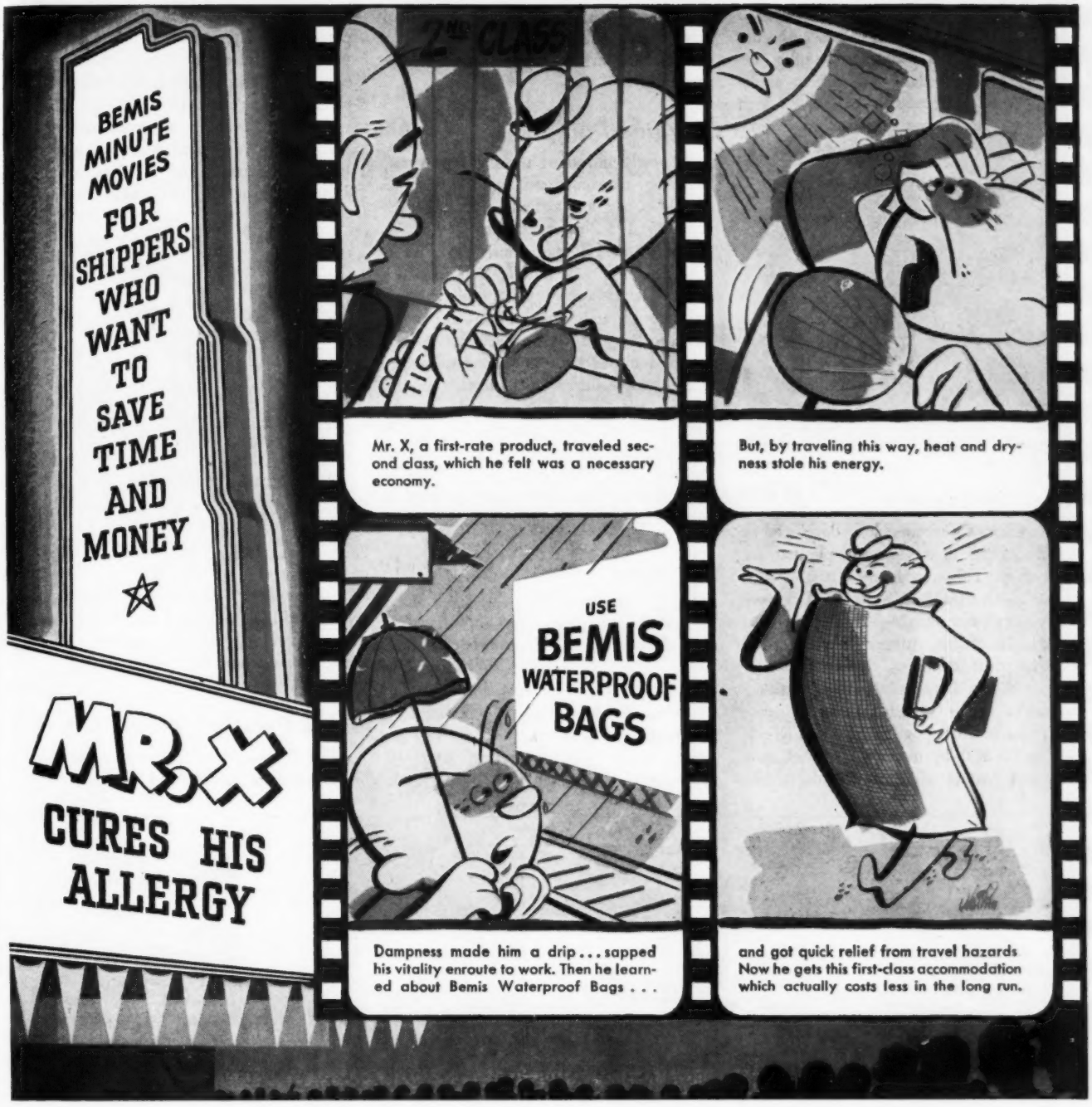
Company .....

Street .....

City..... Zone..... State.....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But, by traveling this way, heat and dryness stole his energy.
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Dampness made him a drip... sapped his vitality enroute to work. Then he learned about Bemis Waterproof Bags . . .
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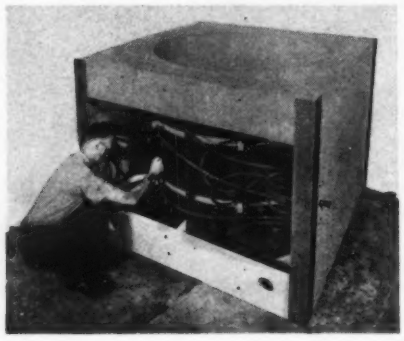
developed right in the autoclave itself and not applied from the outside. Absence of flames or hot resistance heating elements minimizes danger of fire or explosion. Where necessary, extremely high heating speeds can be attained. The heaters can be built to specifications.



Dust Conveyor QB 639

Hapman Conveyors has developed a pipe conveyor to remove accumulated dry dust from collector hoppers which dispenses with dust hopper gates. The conveying system utilizing rubber flighted sealed pin chains, solves the problem of abrasive dust handling. With all round rubber flights in restricted pipe sections, operation under varied pressure or vacuum conditions is possible. One daily collection of dust by means of a truck outside will remove all dust hazards within buildings. One conveyor can receive dust from a series of collector bins and convey and elevate any reasonable height or distance.

Turbine Pump QB 640

A newly improved turbine type pump is being manufactured by the Roy E. Roth Co. for applications requiring pressures to 175 lbs., speeds to 3600 rpm, capacities to 150 gpm, and viscosities to 550 SSU. It will handle liquids of extreme temperature variations without stalling, through use of an automatic, self-adjusting impeller. Very hot liquids can be pumped without vapor-binding.

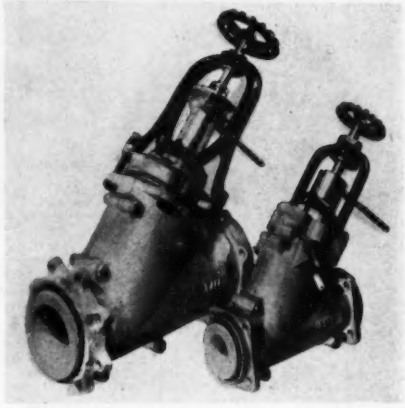
The single multivaned impeller in this turbine type pump develops high pressures in single stage construction. Heads and impeller are available in bronze or stainless steel. The pump is available in a number of sizes and capacities with or without motor, base, and coupling.

Porcelain Valves QB 641

Lapp Insulator Co., Inc., Process Equipment Division, has introduced a new line of armored porcelain valves. These valves are similar to the widely used Lapp porcelain valves, but with the addition of high-strength, heat-treated silicon aluminum armor.

The body, plug, retaining rings—all parts with which chemicals can come in contact—are of solid, non-porous Lapp porcelain. The addition of the armor provides protection for personnel and equipment against porcelain breakage from carelessness or accident

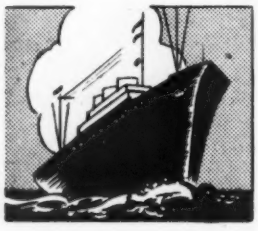
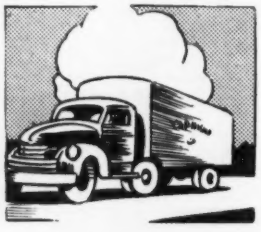
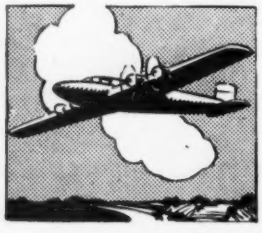
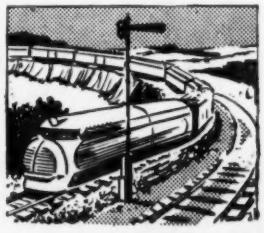
Armored Y valves are available in 1", 1½", 2", 3", 4" and 6" sizes; armored angle valves in 1" and 2" sizes; armored flush valves in 1½", 2" and 3" sizes for



3", 4" and 5" tank outlets respectively. Standard 125-lb. flanges are integral with armor; porcelain faces are machine ground smooth and flat for gasketing.

High Pressure Filter QB 642

The Micro Metallic Corp. now offers high pressure units rated for service at

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SHIP YOUR PRODUCTS IN Fulton WATERPROOF Bags

You will find Fulton Waterproof Bags ideal containers no matter how you ship your products. Sift-proof and moisture proof, Fulton Waterproof Bags are unexcelled for packing and shipping chemicals or any product where dusting or control of moisture content is a consideration. Fulton Waterproof Bags are tough but light for safe and easy handling and storing. Fulton Artcraft Printing gives your brand a plus advertising value. Contact our plant nearest you.

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135 SOUTH LA SALLE STREET

CHICAGO 90, ILLINOIS

PLATE AND WELDING DIVISION

HAROLD D SKYRM
GENERAL SALES MANAGER
JAMES F OLSEN
ASSISTANT SALES MANAGER

October 1948

Subject: Storage of Chemical Process Gases

Gentlemen:

You can now buy a Gasholder, for the storage of process gas, which is trouble-free, winter and summer. This Gasholder is available in any size and is a proven structure having

NO OPERATING COST
PRACTICALLY NO MAINTENANCE COST

In addition it has these unusual features:

1) Absolutely Dry Frictionless Seal.
2) Is not affected by heat, cold, ice, snow, wind, rain – or even earthquakes.
3) Delivers the gas exactly as received – Dry, Pure, Undiluted.
4) Quick purging – has less than 1/2 of 1% dead space.
5) Operates at any pressure up to 20" water.

This outstanding contribution to the Chemical Process Industry has been made by John H. Wiggins, an internationally recognized authority in the field of volatile vapor storage. The Wiggins Gasholder is already being used for storage of hydrogen, carbon monoxide, carbon dioxide, nitrogen, and other process gases.

It is engineered and erected by the General American Transportation Corporation, one of the foremost fabricators of steel plate structures in the world.

We should like to call and explain the operation of the Wiggins Gasholder to you.

Very truly yours,

GENERAL AMERICAN TRANSPORTATION CORPORATION

H. D. Skyrm

H. D. Skyrm
General Sales Manager

HDS:RBD

Sub-licensees

WESTERN STATES: Consolidated Steel Corp.—Western Pipe & Steel Co. of California, Los Angeles—San Francisco • CANADA: Toronto Iron Works, Ltd. Toronto
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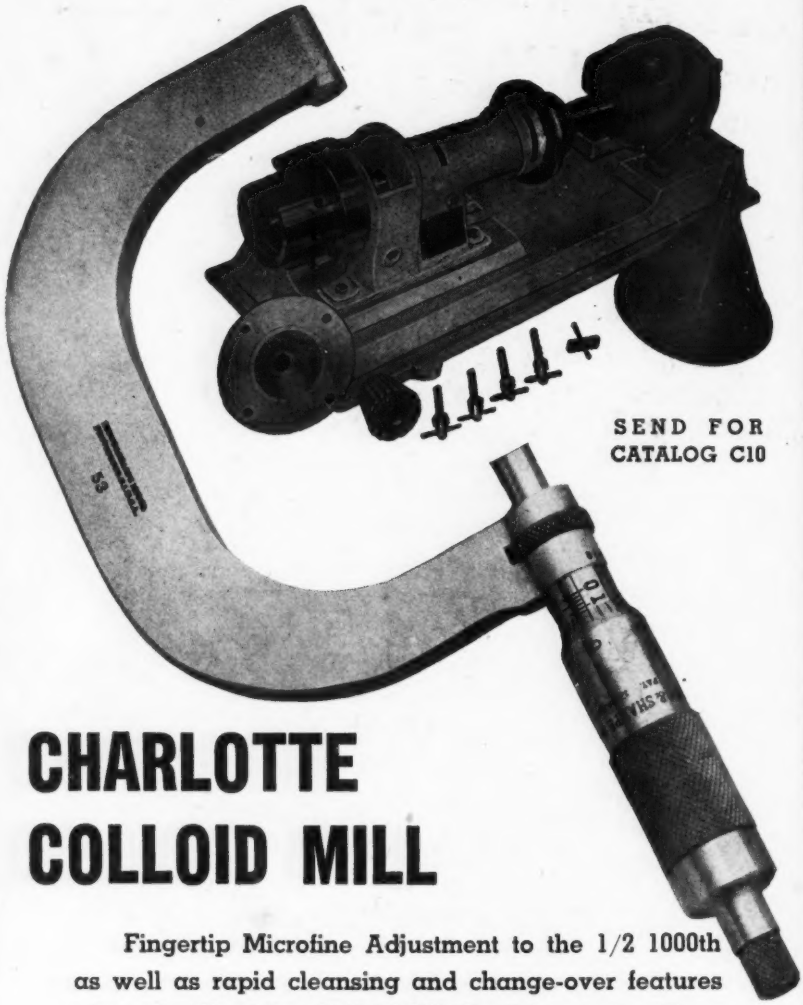
Fingertip Microfine Adjustment

Heavy Duty Precision Machine Tool Construction



SEND FOR CATALOG C10

CHARLOTTE COLLOID MILL

Fingertip Microfine Adjustment to the 1/2 1000th as well as rapid cleansing and change-over features gives the Charlotte Colloid Mill flexible usage. Combine these features with absolute uniformity of product, better plant control, and considerable savings in floor space; and you can eliminate much of old-fashioned bulky equipment used heretofore.

Let our engineering specialist show you the new system of continuous production incorporating the Charlotte Colloid Mill as used now in Paint—Food—Pharmaceutical—Insecticide—Rubber—Synthetic Detergent and many other industries.

G.M.T. COLLOID MILL CORP.

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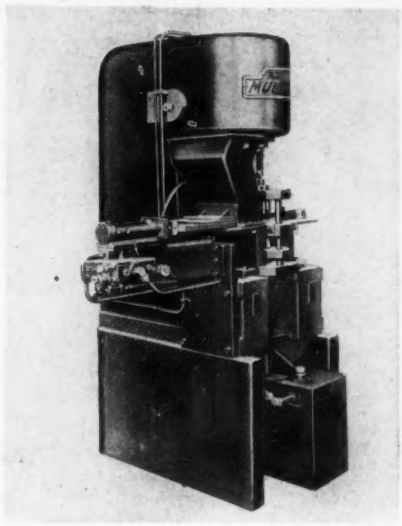
1,000 and 10,000 psi. Filter elements may be specified for use at differential pressures up to 10,000 psi. The high flow capacities characteristic of the porous stainless steel filter material are utilized. Due to the strength of the filter material, no change occurs in the filter even under stresses as high as five tons per sq. in.

The filter containers are provided in carbon steel or in stainless construction. Filter elements are all stainless. Typical applications are: in liquid air manufacture to remove small particles of graphite from graphite lubricated compressors; in rayon, for high pressure clarification; in hydraulic systems, to remove solids which might do some damage to the mechanical parts.

• QB 643 The new *automatic pelleting press* of Dension Eng. Co. for processing powdered or granular forms of ceramics, chemicals, plastics, etc., features independent control of charging, compacting and ejecting ram actions, easy tooling for rapid die changes, and suitability for single or multiple cavity dies — solid or cored parts. Vibratory control is incorporated in both the die charging and the compacting rams.

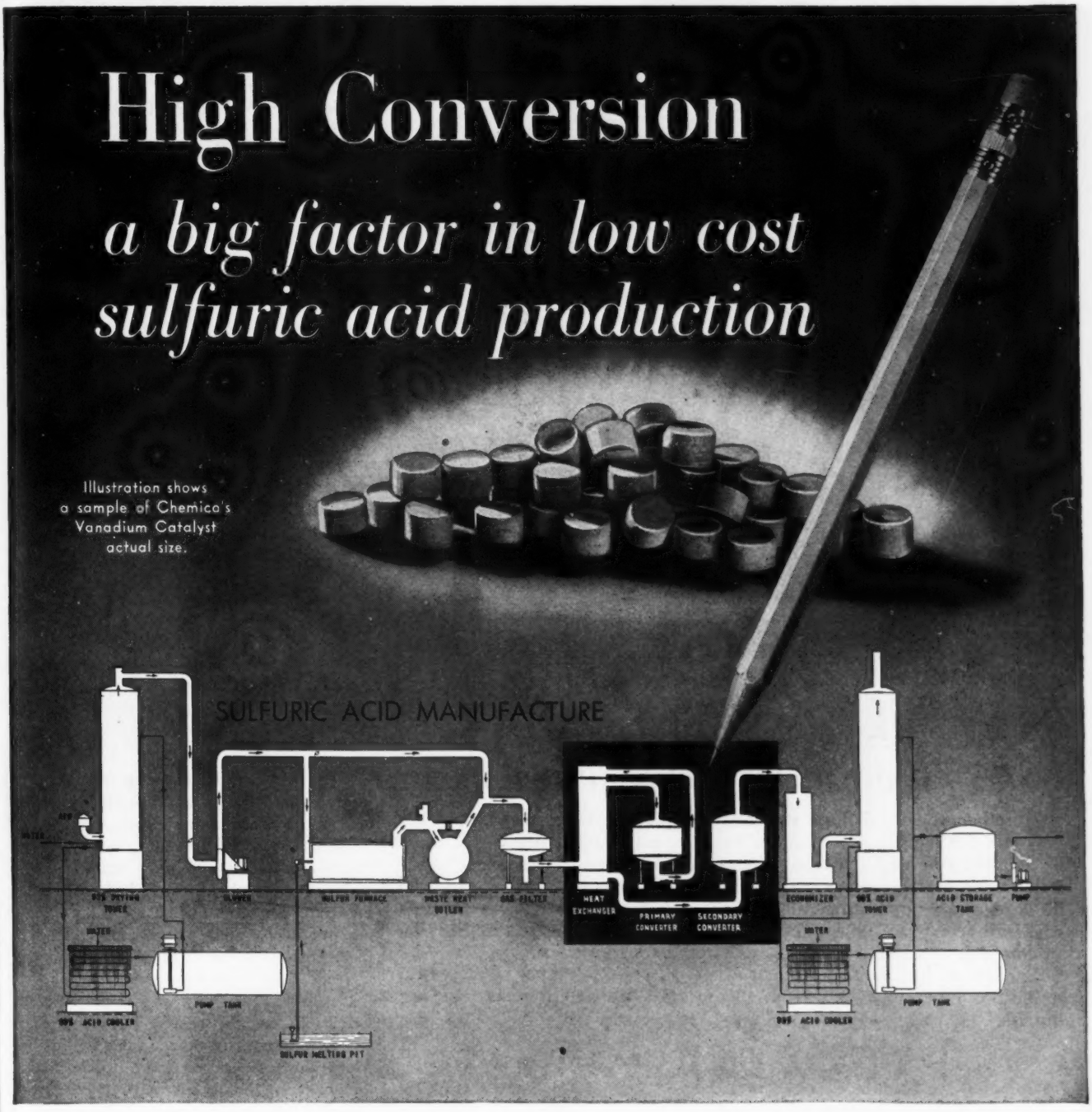


• QB 644 Blaw-Knox Co. is now producing a portable five-gallon *resin pilot plant* complete with instrumentation and working table. The unit provides table space for attachment to purchaser's chemical glassware and auxiliary vessels as may be required.

The kettle has a 2″ charging opening in the top cover but entire cover assembly is readily removable. Discharge is through a 1″ flush plug type valve in bottom head, which provides smooth interior kettle surface and prevents accumulation of residue after discharge. The condenser is of the Liebig type with heat transfer area of 0.5 sq. ft. Internal features include a 5″ straight blade open turbine agitator and

High Conversion

a big factor in low cost sulfuric acid production



The high production rate and low operating cost of modern Chemico Contact Sulfuric Acid Plants are largely due to the well-designed converters and the use of highly effective, non-poisonable Vanadium Catalyst. In a Chemico-built contact plant, you are assured of:

- ***High conversion . . . 96% to 98% SO_2 to SO_3***
- ***High overall operating efficiency of 94% to 96%***
- ***Long life of catalyst***
- ***Perfect control of temperatures for smooth operation***
- ***Maximum utilization of reaction heat through the use of an economizer after the secondary convertor***

Chemico Plants are profitable investments

CHEMICAL CONSTRUCTION CORPORATION

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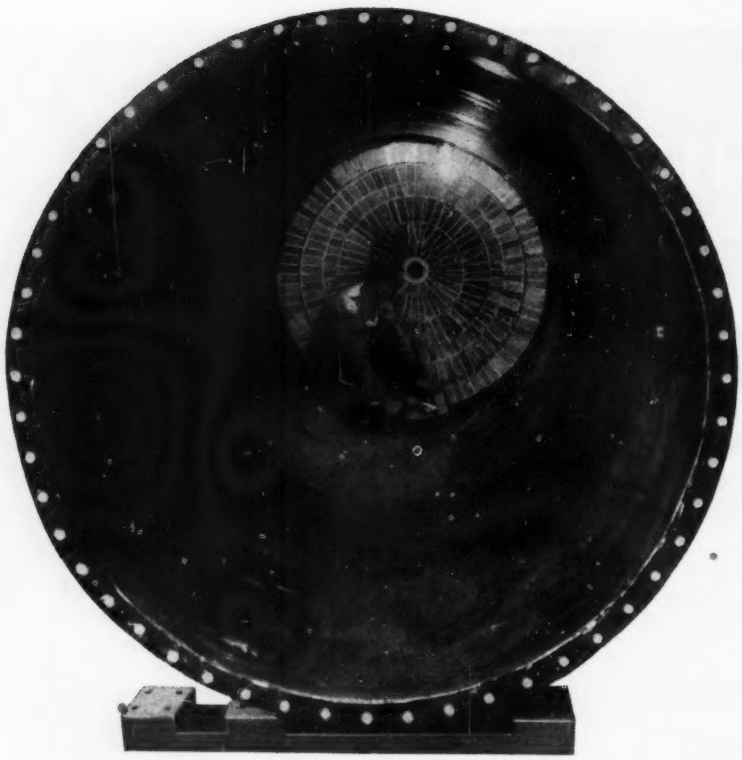


A Pyroflex-lined steel reactor vessel with acid-proof brick and cement sheathing being installed.

PYROFLEX CONSTRUCTION

Means Acid-Proof Functional Equipment

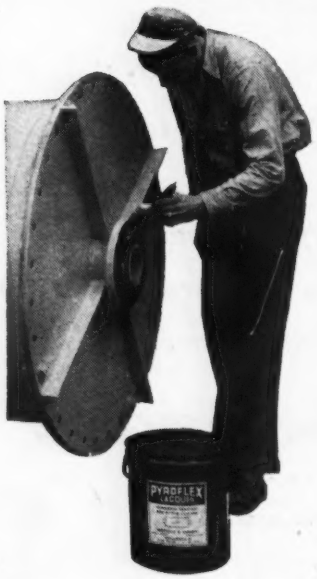
Whether you need fume washers, absorbers, towers, tanks, or other equipment for handling corrosives, Pyroflex constructed functional units will provide you with maximum resistance to corrosive action.

Each unit is designed and built to do a specific job. Engineered with an eye to its operating purpose, the choice of proper materials such as the lining materials, brick, cement, outlets and the method of installation combine to make a unit that will stand up in service.

Pyroflex Functional Equipment is backed by many types of successful installations in various industries. Please give full details when making inquiries.

PYROFLEX PAINT

for Exterior Protection



We use it on the outside of all our Pyroflex-lined steel tanks. Pyroflex lacquer is highly resistant to the action of acids, alkalies and other corrosive agents and may be used on metal, concrete, wood or previously painted surfaces — no primer coat required. Some companies use it on all exterior surfaces subject to corrosive action.

Available from stock in grey, black and white, shipped in 1-, 5- or 50-gallon containers. Red, green, aluminum and clear may be had in minimum lots of 50 gallons. For further details, write

MAURICE A. KNIGHT

212 Kelly Avenue Akron 6, Ohio

helical cooling coil. The latter may also be used as a steam heating coil for preheating.

Heat is applied by three electrical resistance heaters attached to outside of kettle at varying heights. The heaters are arranged in three circuits, used singly or in combination. Each has a capacity of 2 kwh. Variable speed of agitation is provided by a ½ hp. motor drive and step pulleys. Speeds range from 443 to 860 fpm (peripheral speed of turbine). The allowable process pressure ranges are from 15 psi. internal pressure to full internal vacuum.

• QB 645 Bin-Flo, a new *aerating device* of the Bin-Dicator Co. provides uniform flow of bulk materials from bins, hoppers, and chutes. The Bin-Flo unit is a small plate 3¾" x 7½" x ½" thick which is readily located at points where flow is restricted. Low-pressure air is injected into the material through a special fabric diffuser, causing the material to flow freely. Bin-Flo units do not plug even with the most finely ground material and are applicable to most dry, finely-ground materials.

Models are provided for thin-walled bins and chutes and for concrete and other thick-walled hoppers. Piping can be run either outside of thin-walled bin or inside of thick-walled container.

• QB 646 A new *pneumatic control mechanism* is now incorporated into all Fischer & Porter flow controlling instruments. All important working parts are made from precision castings or heavy stampings, precision trimmed and carefully inspected to assure complete interchangeability A minimum of tubing connections eliminates air leakage troubles. Alignment of pen and index is certain throughout the range since both index and input links swing on a common center. Valve action is easily reversible without altering link relationships. The pen faithfully tracks the set point throughout the 0 to 200% throttling range adjustment. Reset is calibrated from 0.2 to 50 min.

• QB 647 A new model, known as the Filt-R-Stil *demineralizer* Model U-60-2B, has been added to the demineralizers offered by American Cyanamid Co. Designed to deliver the low-cost chemical equivalent of distilled water by ion exchange, this new two-bed model is designed for users requiring approximately 60 gals. per hour of water containing 5 to 20 ppm (as $CaCO_3$) of dissolved ionized solids; where water of higher quality is required, or where the raw water available is relatively high in total solids, the standard, four-bed Model U-60 is recommended.

The new model consists essentially of two columns, one containing Ionac cation exchange resin C-200 and the other Ionac anion exchange resin A-300, plus the

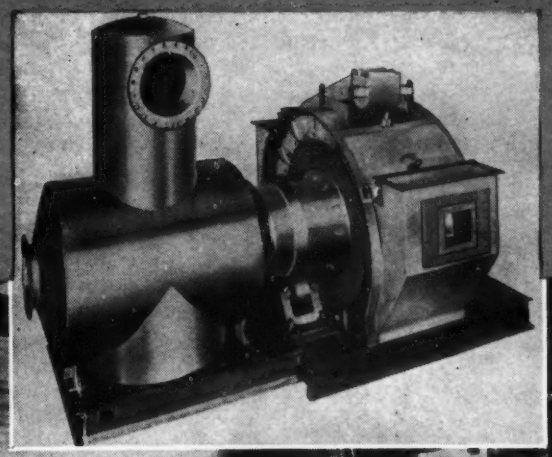
Continuous Rotary Dryers

Eimco Continuous Rotary Dryers are top-feed type machines for use in drying crystalline products such as salt, ammonium sulphate, foundry sand and other granular materials which dewater rapidly.

Dryers are built of monel, stainless steel or other materials as specified, and the dryness of the finished product can be controlled within narrow limits as desired.

Eimco Continuous Dryers provide fully automatic, continuous operation and lower first cost than previous types of equipment used for dewatering these materials.

Each unit is constructed for the particular type of work it is to do. Write, giving details of your process for more information on Eimco Continuous Rotary (top-feed) Dryers.



EIMCO

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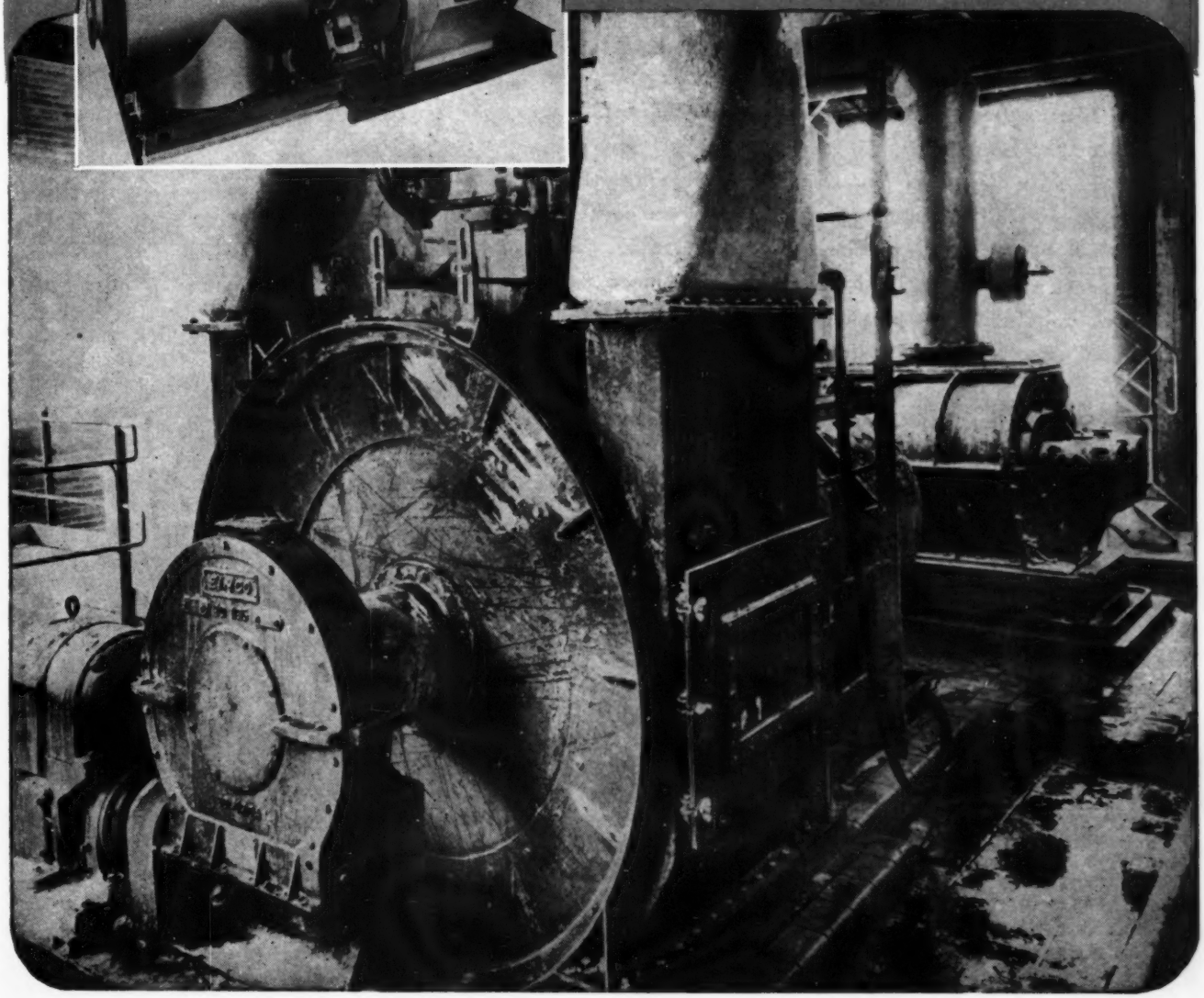
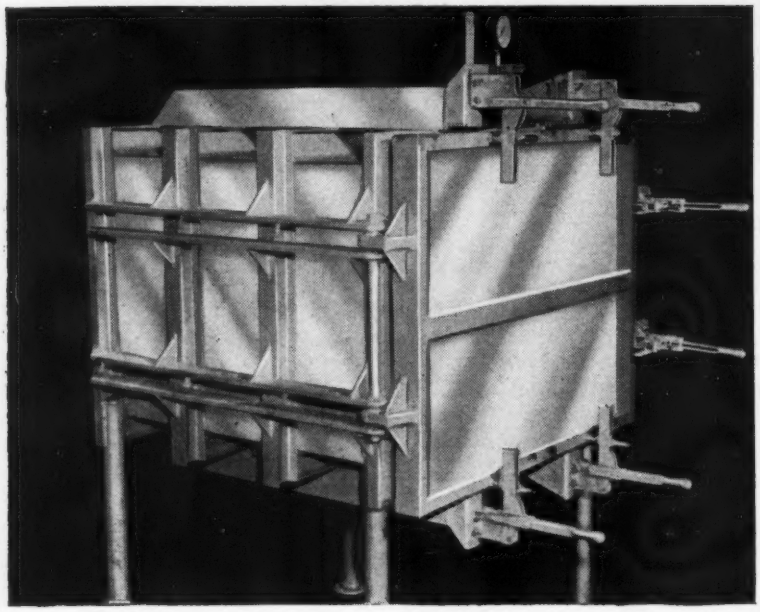
EIMCO (GREAT BRITAIN) LTD., LEEDS 12, ENGLAND
AGENTS IN ALL PRINCIPAL CITIES THROUGHOUT THE WORLD



Stainless Steel

MEANS GREATER SAVINGS



If it's a pressure chamber (as illustrated), tanks, vats or the many metal fabrications used in your plant . . . *Stainless Steel will mean greater savings.* Being non-corrosive, Stainless Steel eliminates the possibility of wet materials becoming contaminated. Colors remain true in successive runs. Lower upkeep, fewer repairs and rejections mean greater savings . . . so be sure to specify Stainless Steel.

Engineering facilities geared to industry's needs, for the fabrication of both stainless and carbon steel, are available to you. Truitt . . . *one of the South's most important fabricators of steel,* will gladly figure your job without cost or obligation.

TRUITT

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Fabricators of Solid Stainless Steel and Stainless-Clad Tanks • Dyeing Vats • Washing Tanks • Steam Drums • Storage Tanks for Acids and Alkalis • Mechanical Agitators • Separators • Stainless Steel Trucks • And Many Other Stainless Steel Products.

valves, piping, and tanks required for regenerating the resins when exhausted by the minerals which they have removed.

The regenerants required per cycle are 3 pounds of acid and 1.5 pounds of caustic.

• QB 648 A new *high-tension fabric conveyor belt* called Raynile, for jobs where belt tensions run as high as 1,000 pounds per inch of width is being manufactured by the Hewitt Rubber Division, Hewitt-Robins Inc. The strength-material consists of a combination of rayon and nylon, offering greater strength than the standard types of cotton woven fabrics or cord belts.

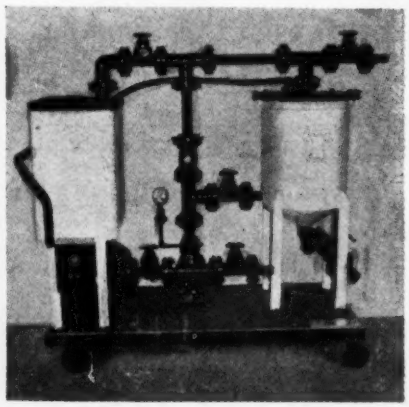
Important features include maximum tensions almost double that offered by 48-ounce cotton fabric; excellent transverse flexibility, assured by the nylon transverse threads; minimum stretch in actual operation, and field splicing made easy because of fabric construction.

• QB 649 The improved, heavy-duty *intensive mixer* of Struthers Wells Corp. features a large discharge opening which appreciably reduces loading and unloading time.

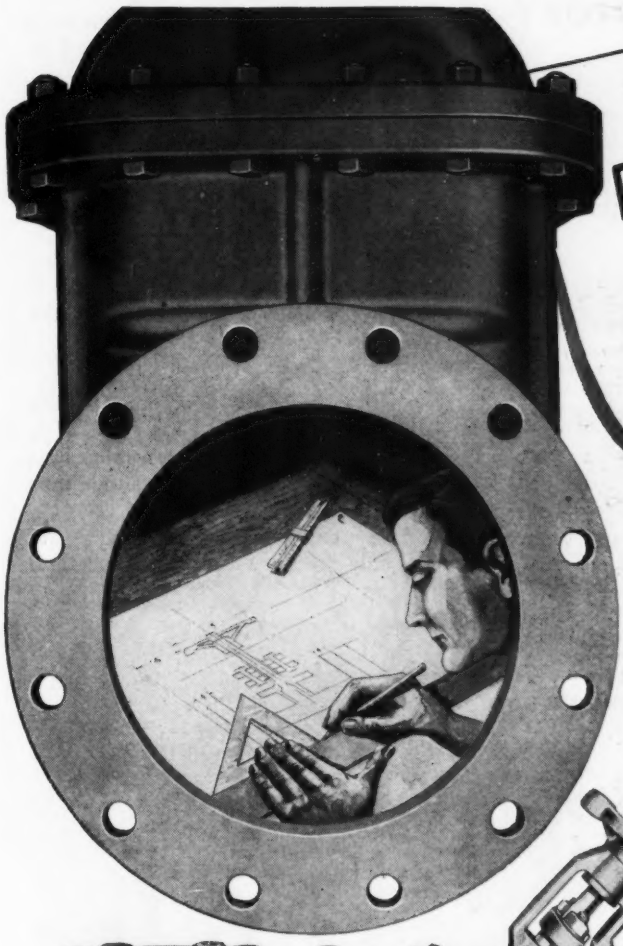
Particularly adaptable for the rapid processing of rubber, plastics, and linoleum asphalt composition, the mixer is equipped with a rigid-construction, one-piece liquid and dust-tight mixing chamber. Continuous running-oil lubrication contributes to a shortened operating cycle, and safety and cleaning ease are assured by the complete enclosure of all working parts. Metal-to-metal shaft seals around the blade axles at the trough heads resist leakage.

• QB 650 A new series of *filters* constructed of Saran-lined steel pipe and fittings and rubber-lined filter and precoat tank is available from Titeflex, Inc.

The new Titeflex filters, series SLA, combine a high degree of corrosion resist-



ance with the supporting strength of steel backing. The filters can be used at temperatures between 0° F. and 180° F. for general service. Both the Saran-lining and the rubber-lining have excellent insulating



There's Precision Engineering in every POWELL VALVE

Powell makes valves by the thousands. We have to in order to satisfy the nation-wide demand.

But don't be misled! We know that quality often suffers through so-called "mass production" methods. So every Powell Valve from a standard small bronze globe to the most special design for corrosion resistance is given the most meticulous, individual attention. That's why Powell Valves have such an outstanding reputation for long life and dependable performance in every branch of industry. It pays to install Powell Valves.

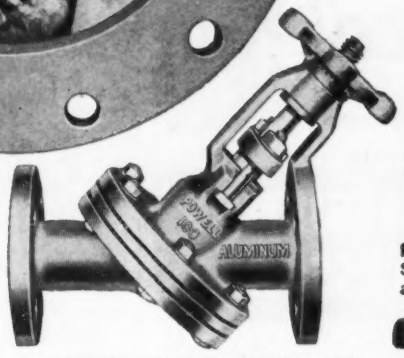


Fig. 1097-AL—Aluminum "Y" Valve with Separable Body, Reversible Seat, flanged ends, outside screw rising stem and yoke.

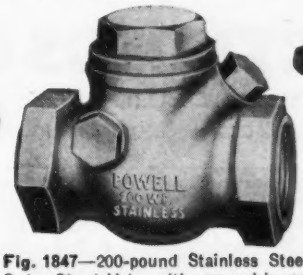


Fig. 1847—200-pound Stainless Steel Swing Check Valve with screwed-in cap and regrindable, renewable disc.

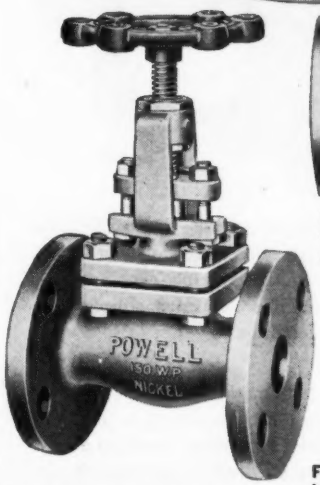


Fig. 1979-NI—150-pound Nickel Globe Valve with flanged ends, bolted flanged yoke-bonnet and outside screw stem.

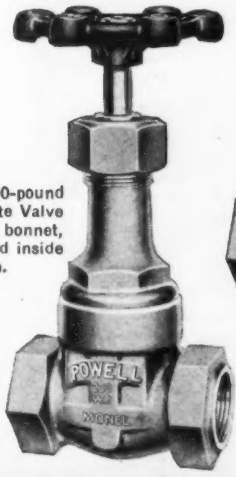


Fig. 1828 — 200-pound Monel Metal Gate Valve with screwed-in bonnet, screwed ends and inside screw rising stem.

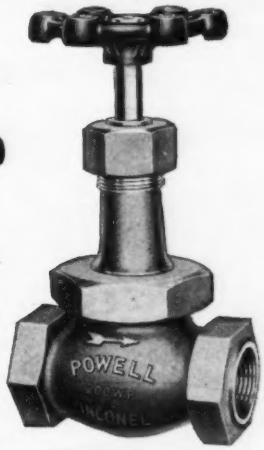


Fig. 1861-IN—200-pound Inconel Globe Valve with screwed ends, union bonnet and inside screw stem.

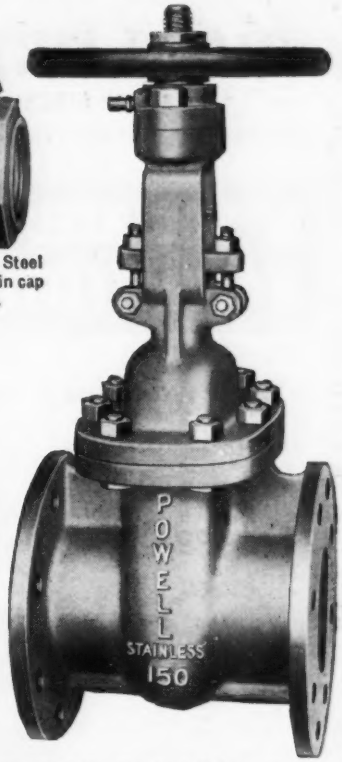


Fig. 2453-G—Standard 150-pound Stainless Steel Gate Valve with flanged ends, outside screw rising stem, bolted flanged yoke-bonnet and tapered solid wedge.

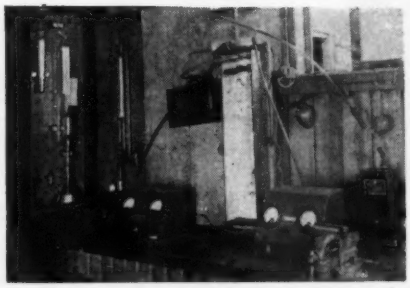
The Wm. Powell Co.
Cincinnati 22, Ohio
DISTRIBUTORS AND STOCKS IN ALL PRINCIPAL CITIES

If you do not have your copy of Powell Valve Catalog No. 242 "Powell Valves for Corrosion Resistance"—write for one.

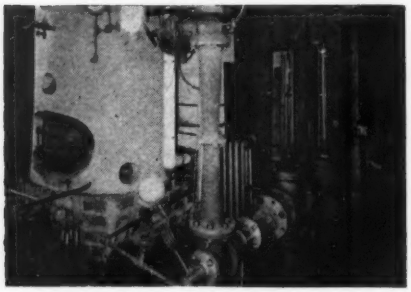
POWELL VALVES

What's Behind a CR Evactor?

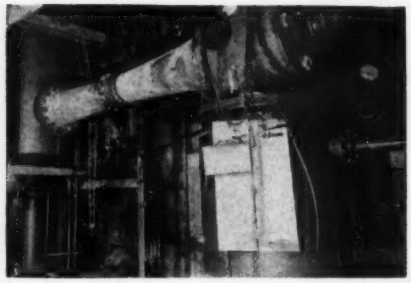
The production of Evactors is no routine operation at the Croll-Reynolds plant. Although CR engineers have over thirty years of industrial vacuum experience to guide them, the Croll-Reynolds testing and development department is one of the important units of the company. Development work is constantly under way to improve the efficiency of Croll-Reynolds Evactors wherever it is possible. It is this never-ending research and development which give CR Evactors their exceptional efficiency.



1. Instruments in the CR laboratory set up for measuring extremely high vacuum.



2. Special boiler in the CR pilot plant for providing unusual conditions of high pressure steam or superheat (or both) to duplicate the working conditions in customers' plants.



3. A 30-inch CR Booster Evactor on test in a CR shop.

CROLL-REYNOLDS CO.

17 JOHN STREET, NEW YORK 7, N. Y.

CHILL VACTORS STEAM JET EVACTORS CONDENSING EQUIPMENT

CROLL-CR-REYNOLDS

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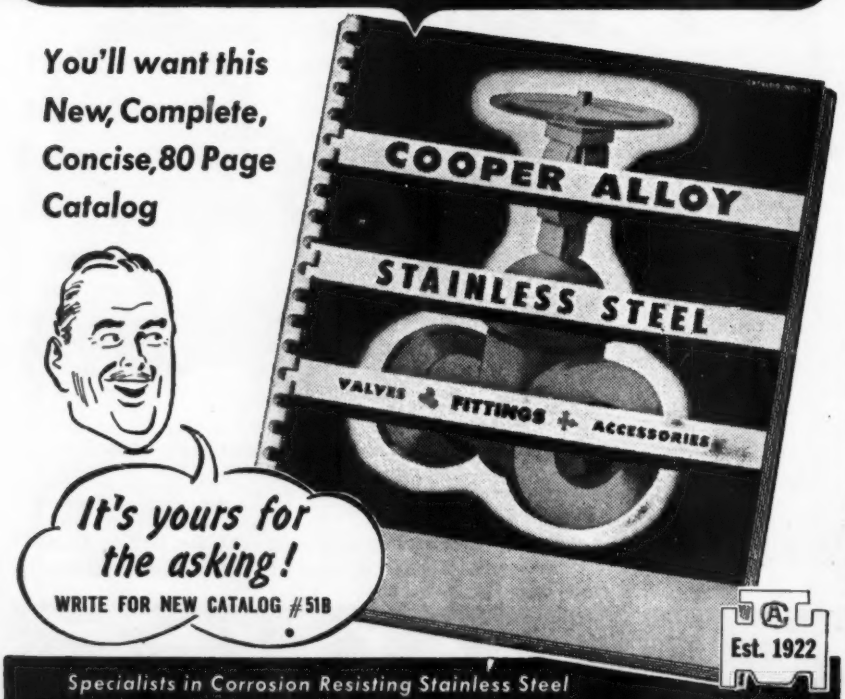
You'll want this New, Complete, Concise, 80 Page Catalog



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Specialists in Corrosion Resisting Stainless Steel

THE COOPER ALLOY FOUNDRY CO.

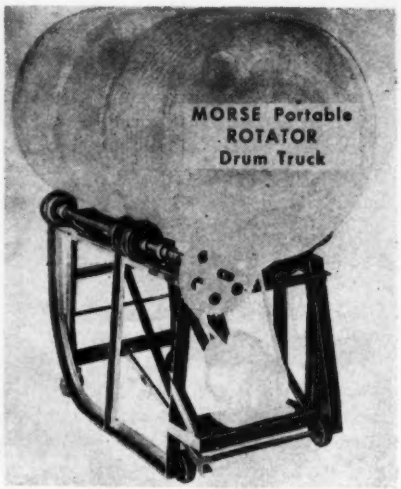
HILLSIDE, NEW JERSEY

properties and, therefore, help maintain an even temperature in the solutions being filtered. They also exhibit very good resistance to erosion and abrasion.

The SLA series uses the filtration principle of other Titeflex filters; that is, a rigid synthetic membrane of porous stone is used to support "filter aid," which is the filtering media. Cleaning is accomplished by a new method of back-washing which cleans the filter in a few minutes. Suspended particles down to 1/10 of a micron are removed by this method.

• QB 651 A new low-priced *portable drum truck* that will smoothly and safely rotate a 30 or 35 gallon steel drum by a small electric motor is now available from Morse Mfg. Co.

The rotator will efficiently and smoothly revolve a maximum drum load



of 500 pounds at speeds up to 50 rpm. Swivel casters, retractable by foot lever, at front end make steering easy and the retractable feature prevents slippage of the truck in loading.

• QB 652 Automatic Temperature Control has placed in production a *precision pressure measuring* system based on applying a differential transformer which develops a linear output to standard primary measuring elements such as bourbon tubes or bellows. The armature is direct-connected to the tube tip—no jewel bearings, pivots, springs or similar movements are used. Zero adjustment is embodied in a simple thumb screw. Accuracy is within ¼ of 1%, sensitivity of 1 part in 4000. K-Monel bourdon tubes mounted in dust-tight enclosures are suitable for service on many corrosive applications. Range 0 - 10,000 psi.

• QB 653 The *automatic electric alarm system* of the Henszey Co. is incorporated into a flow indicator. An electric alarm—either light or sound—is set off when the high or low limits of flow are reached.

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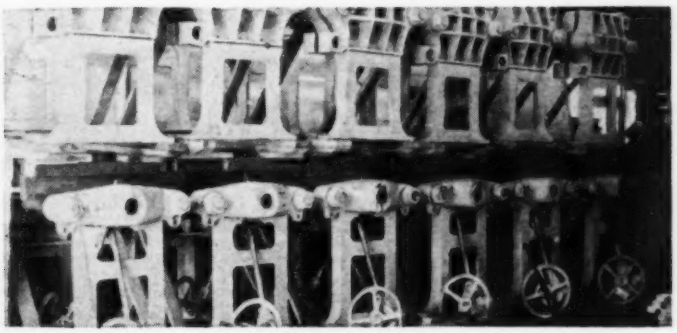


PACKAGING & SHIPPING

by T. PAT CALLAHAN

Seal Fibre Boxes Properly

SHIPMENT OF considerable quantities of chemicals and allied products in corrugated and solid fibre boxes justifies close attention to the problem of properly sealing them. Unsatisfactory seals may be the cause of damaged shipments, and any preponderance of such claims may lead to curtailment in the use of such packages or an increase in their transportation rates. There is much information on how to avoid improperly sealed containers in the recent Fibre Box Memo No. 7 entitled "Sealing Fibre Boxes with Gummed Tape," one issue of the pamphlet *Fibre Box Memo,* distributed occasionally by the Fibre Box Association, 224 So. Michigan Ave., Chicago 4, Ill. Several sections are of sufficient importance to chemical shippers to point out their highlights here.

Improperly applied gummed tape is of no value in protecting a shipment in a corrugated or fibre box. Good quality gummed tape is made to stick to the box. Here is how it works: Gummed sealing tape has one of its surfaces coated with a solid, yet flexible, layer of strong water-soluble adhesive. When properly moistened, this adhesive forms a sticky solution which, upon application of tape to a box, penetrates deeply into the pores of the fibre board. The adhesive, in hardening, forms countless thousands of tiny "hooks" which grip the fibres of the box. The result is a strong permanent bond—in fact, the tape cannot be torn from the box without taking with it a portion of the surface material.

One of the chief hazards in preserving the quality of gummed tape is in the storage of the tape before its use. The following facts about the storage of gummed tape will prove very helpful in insuring the tape to be in proper condition when it is to be used:

1. *Temperature.* Store in room kept at moderate temperature. If the tape is too cold, the adhesive will not absorb water properly and its sticking qualities will be impaired. If it is too hot, it will become brittle and prematurely aged. Recommended temperature range: 60° to 80°.
2. *Humidity.* Maintain moderate humidity in storeroom. If the adhesive on tape becomes damp in storage, it will not work properly. To be on the safe side, tape should be stored away from steam or water pipes, off cold floors, out of drafts, and generally, away from all possible sources of dampness. On the other hand, tape stored where the prevailing humidity is unusually low will dry out. Avoid both extremes. Recommended relative humidity range: 15% to 70%.
3. *Age and freshness.* Tape in storage is affected by aging. Always use the oldest tape first. Do not open bundle of tape until ready to use it since the wrapper is moisture-proof. As each roll is removed, the wrapper should be tucked in to protect the remaining rolls.

Another factor which must be considered in the application of gummed tape is the type of dispenser and the condition of the dispenser used. The tape dispenser needs attention and the following recommendations should be complied with in order that the dispenser is at all times in proper condition:

Keep the water level up. Unless dispenser has automatic water control, it must be checked regularly and the water tank refilled. A half-filled or nearly-empty tank means dry tape, and dry tape won't stick.

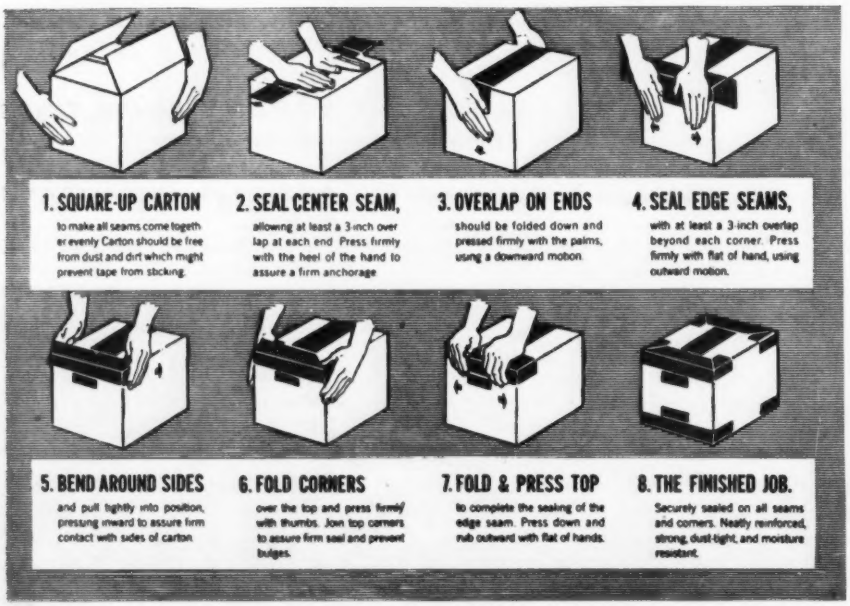
Keep brushes, rollers and water tank clean. For best results they should be washed daily in warm, soapy water.

Replace worn-out brushes. Bristles that are worn away or uneven cannot properly moisten the tape.

Use the dispenser properly. When using the simple hand operated "pull-type" dispenser, always pull the gummed tape outward and downward so that it is in full contact with the brush or roller.

Automatic dispensers. Semi-automatic and fully-automatic dispensers enable the user to do a better job faster. The use of such devices, instead of the hand-operated type, is generally recommended.

When the above recommendations in the care of tape and dispenser are coupled with proper application to the box, a permanent weld with the carton will be obtained. To perform this operation with a maximum of efficiency, the eight-step method worked out by the Gummed Industries Association, Inc., whose members are manufacturers of gummed tape, should be followed. The accompanying diagram shows how six strips of tape applied with the proper pressure seal a package to stand the rigors of shipment. This method of sealing meets all requirements of Consolidated Freight Classification Committee—Rule 41, as well as Express and Parcel Post regulations—when using the minimum 60 lb. basis weight of tape, 2-inch width or over.


1. SQUARE-UP CARTON
to make all seams come together evenly Carton should be free from dust and dirt which might prevent tape from sticking.
2. SEAL CENTER SEAM,
allowing at least a 3-inch overlap at each end. Press firmly with the heel of the hand to assure a firm anchorage.
3. OVERLAP ON ENDS
should be folded down and pressed firmly with the palms, using a downward motion.
4. SEAL EDGE SEAMS,
with at least a 3-inch overlap beyond each corner. Press firmly with flat of hand, using outward motion.
5. BEND AROUND SIDES
and pull tightly into position, pressing inward to assure firm contact with sides of carton.
6. FOLD CORNERS
over the top and press firmly with thumbs. Join top corners to assure firm seal and prevent bulges.
7. FOLD & PRESS TOP
to complete the sealing of the edge seam. Press down and rub outward with flat of hands.
8. THE FINISHED JOB.
Securely sealed on all seams and corners. Neatly reinforced, strong, dust-tight, and moisture resistant.

Package Development Course at N.Y.U.

A course of fifteen lectures on Package Development and Promotion is being given by New York University, Division of General Education, Washington Square, New York 3, New York. Hours for lectures in the series, to run until January 24, 1949, will be 6:15 p. m. to 8:00 p. m. The fee is $30.00 for the entire course or $2.50 per lecture.

MCA Data Sheet On Perchloroethylene

The Manufacturing Chemists' Association has published Chemical Safety Data Sheet SD-24 on Perchloroethylene, the 24th in the series of chemical product safety manuals being prepared by them. Designed for supervisory staffs and man-

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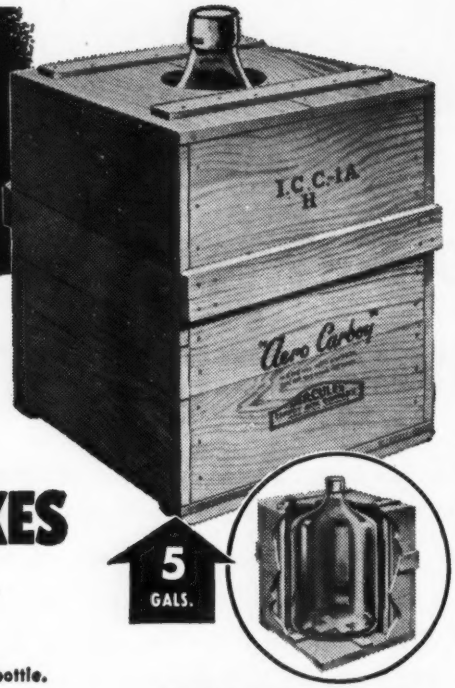

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This development removes one of the principal limitations of some excellent adhesives for difficult glass surfaces which would only operate on a limited number of machine types.

Labeltite 405 is available in quantity and full information may be obtained from National Adhesives sales offices located in all principal cities.

Additional Amendments To ICC Regulations

In addition to the changes listed in the Packaging & Shipping section of the September issue, the Interstate Commerce Commission Rules and Regulations were amended on July 22, 1948 as follows:

Section 270, paragraph (a) (Phosphorus tribromide, phosphorus trichloride, etc.) was amended as follows:

> 270 (a) Phosphorus tribromide, phosphorus trichloride, phosphorus oxychloride, and thiophosphoryl chloride must be packed in specification containers as follows:

The reason for this amendment was to provide for a new material, namely thiophosphoryl chloride.

Section 271 (Phosphorus oxychloride, phosphorus trichloride) paragraph (a) was amended as follows:

> 271 (a) Phosphorus oxychloride, phosphorus trichloride and thiophosphoryl chloride may be shipped in specification containers as follows:

The reason for this amendment was to provide specification containers for the addition of thiophosphoryl chloride.

Section 276 (Anhydrous hydrazine and hydrazine solution, etc.) paragraph (d) was amended as follows:

> (d) Spec. 5A, 5, or 17E.—Metal drums which shall be of type 304 or 347 stainless steel.

The reason for this amendment was to provide for additional single-trip drums which must be constructed of type 304 or 347 stainless steel for the shipment of this material.

Section 303 has been amended in several places to provide more definite procedure for the safe maintenance of cylinders. Reference to section 303 in the revised Regulations is suggested with regard to the changes and procedure now authorized.

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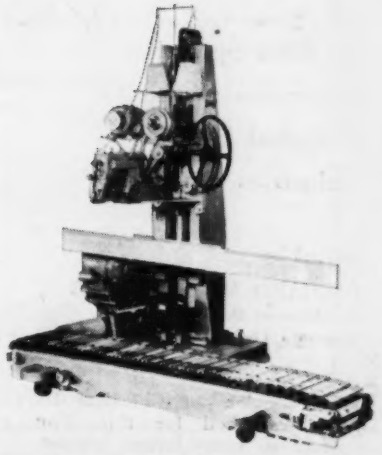

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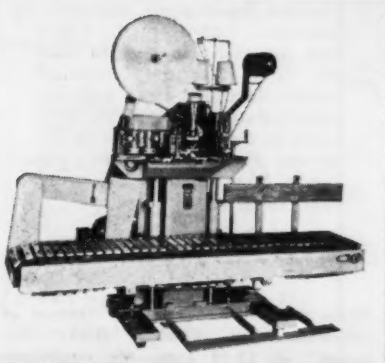

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Section 303 (Restrictions for gases named in table) paragraph (k) was amended as follows:

Kind of Gas	Maximum permitted filling density (see sec. 303(h)).	Cylinders* marked as shown in this column must be used except as provided in note 1 and sec. 303 (p) (2) to 303 (p) (6).
Dichlorodifluoromethane	Per Cent 119	ICC-3A225; ICC-3B225; ICC-4A225; ICC-4B225; ICC-4BA225; ICC-9
Methyl chloride (see note 4)	84	ICC-3A225; ICC-3B225; ICC-4A225; ICC-4B225; ICC-4BA225; ICC-3; ICC-4; ICC-25; ICC-26-300; ICC-38
Sulfur dioxide	125	ICC-3A225; ICC-3B225; ICC-4A225; ICC-4B225; ICC-4BA225; ICC-3; ICC-4; ICC-25; ICC-26-150; ICC-38

*This table permits cylinders of lower service pressure for the shipment of these materials. These cylinders are considered to be adequate for transportation.

Note 12 to sec. 303 (Compressed gases in tank cars) paragraph (q)(1) has been amended as follows:

Note 12.—Tanks complying with specification 106A500, containing chlorine, anhydrous ammonia, sulfur dioxide, methyl chloride, dichlorodifluoromethane, monochlorodifluoromethane, monochlorotetrafluoroethane, vinyl chloride, inhibited, difluoroethane, difluoromonochloroethane, may be transported on trucks or semi-trailers only, when securely chocked or clamped thereon to prevent shifting, and provided adequate facilities are present for handling tanks where transfer in transit is necessary. See paragraph (b)(2), sec. 560, for rail freight-motor vehicle shipments.

The reason for this amendment is to provide authority for materials recently added to I. C. C. Regulations to be transported on motor vehicles, as now provided for similar materials. The two materials specifically referred to are difluoroethane and difluoromonochloroethane.

Section 328 was amended as follows:

(Add) (d) Chlorpicrin may also be packed in specification containers as follows:

(Add) (d)(1) Spec. 128B.—One-piece corrugated fiberboard boxes at least 200-pound test with inside glass bottles or tubes, in hermetically sealed metal cans in individual unsealed one-piece corrugated fiberboard boxes Spec. 12B at least 200-pound test. Bottles must contain not over 1 pound of liquid each, must be filled to not over 95 percent capacity, must be tightly and securely closed and must be cushioned in cans with at least ½ inch of absorbent material. Cans must be made of metal at least 32 gauge U. S. standard. Total amount of liquid in outside box must not exceed 12 pounds.

(Add) (d) (2) Spec. 12B.—One-piece corrugated fiberboard boxes at least 200-pound test with not more than one inside glass bottle or tube in a hermetically sealed metal can. Bottles must contain not over 1 pound of liquid, must be filled to not over 95 percent capacity, must be tightly and securely closed and must be cushioned in cans with at least ½ inch of absorbent material. Cans must be made of metal at least 32 gauge U. S. standard.

The reason for this amendment is to provide additional containers for shipments of chlorpicrin, the efficiency of which has been proved by adequate tests.

Section 329 (Chlorpicrin or mixtures of chlorpicrin with nonpoisonous liquid), paragraph (a) was amended as follows:

329(a) Chlorpicrin or mixtures of chlorpicrin with nonpoisonous liquid, in addition to containers prescribed in sec. 328, when offered for transportation by carriers by rail freight, highway, or water may be shipped as follows:

The reason for this amendment is to eliminate the shipment of chlorpicrin and other gases as no commercial shipments of chlorpicrin and other gases are now being shipped, and recent developments indicate the product could be unsafe.

Section 329 (Chlorpicrin or mixtures of chlorpicrin with noninflammable liquid) is amended as follows:

(d)(1) Spec. 12B.—One-piece corrugated fiberboard boxes at least 200-pound test with inside glass bottles or tubes, in hermetically sealed metal cans in individual unsealed one-piece corrugated fiberboard boxes Spec. 12 B at least 200-pound test. Bottles must contain not over 1 pound of liquid each, must be filled to not over 95 percent capacity, must be tightly and securely closed and must be cushioned in cans with at least ½ inch of absorbent material. Cans must be made of metal at least 32 gauge U. S. standard. Total amount of liquid in outside box must not exceed 12 pounds.

(d)(2) Spec. 12B.—One-piece corrugated fiberboard boxes at least 200-pound test with not more than one inside glass bottle or tube in a hermetically sealed metal can. Bottles must contain not over 1 pound of liquid, mus be filled to not over 95 percent capacity, must be tightly and securely closed and must be cushioned in cans with at least ½ inch of absorbent material. Cans must be made of metal at least 32 gauge U. S. standard.

The reason for this amendment is to provide additional containers for shipments of chlorpicrin, the efficiency of which has been proved by adequate tests.

A new section, 331A, has been added:

331A (a)(1) Hexaethyl tetraphosphate and tetraethyl pyrophosphate mixtures with compressed gas, containing not more than 10 per cent by weight of hexaethyl tetraphosphate or tetraethyl pyrophosphate must be packed in specification containers as follows:

(a)(2) Spec. 3A300, 3B300, 4A300, 4B240, or 4BA240.—Metal cylinders, charged with not more than 5 pounds of the mixture and to a maximum filling density of 80 percent of the water capacity.

(a)(3) Cylinders must be packed in strong wooden boxes with valves or other closing devices protected from injury, with not more than twelve cylinders in one outside wooden box.

(a)(4) Cylinders must not be equipped with eduction tubes or fusible plugs. Valves must be of a type acceptable to the Bureau of Explosives.

The reason for this amendment is to provide safe transportation for new articles in commerce.

Section 338 (poisonous liquids, class B) paragraph (a) has been amended as follows:

338 (a) Poisonous liquids, class B, as defined in sec. 336, except aniline oil, hydrocyanic acid solutions, methyl bromide, motor fuel anti-knock compound, phenyldichlorarsine and tetraethyl lead, in tightly closed inside containers, securely cushioned when necessary to prevent breakage and packed as follows, are exempt from specification, packaging, marking, and labeling requirements for transportation by rail freight, rail express, or highway, but when for transportation by carrier by water are exempt from specification packaging, marking other than name of contents, and labeling requirements:

The reason for this amendment is to clarify meaning of the regulations. This

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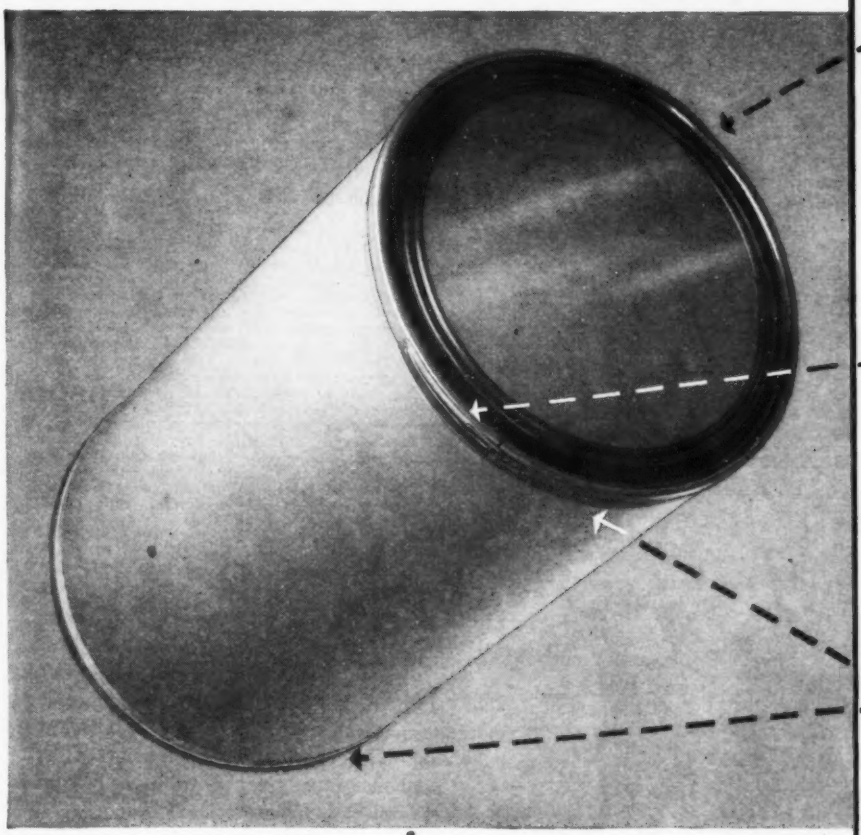

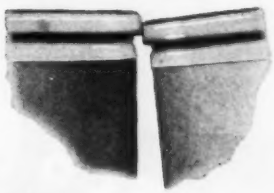

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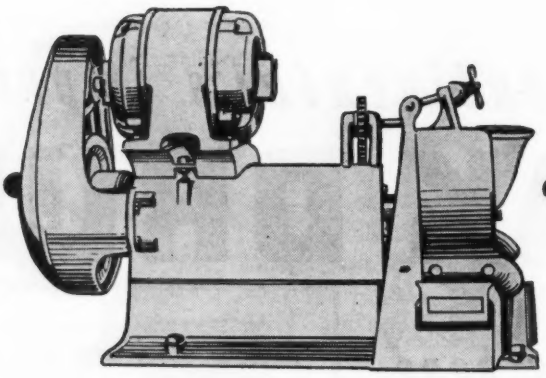

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also includes aniline oil as being an exception to the exemptions in this paragraph.

Section 361 (Poisonous solids, as defined in sec. 350, etc.), paragraph (g) has been amended as follows:

(g) Spec. 12B or 12C.—Fiberboard boxes, with inside containers which must be: Metal cans not over 25 pounds capacity each; glass bottles not over 1 gallon capacity each; fiber cans or boxes, spec. 2G; sliding-top wooden boxes, lined to prevent shifting, not over 25 pounds capacity each; or paper bags, spec. 2D. Packages containing glass or earthenware containers must not weigh over 65 pounds gross nor contain more than 4 inside containers of over 5 pints capacity each. Outside containers must be not over 5,000 cubic inches capacity nor contain over 50 pounds net weight each, except as provided in paragraph 31 of Spec. 12B.

TEST.—The completed package prepared as for shipping must be capable of standing a drop of 4 feet to solid concrete without breakage of the container or any sifting of contents.

This amendment eliminates the requirement of presently required taping, as experience and tests have developed that this package is adequate for shipments without taping.

Section 402 (Labels and marking), paragraph (p) has been amended as follows:

(p)(1) Labels and marking name of contents are not required on carload or truckload quantities of dangerous articles by rail freight, rail express or highway, when such shipments are unloaded by the consignee or his duly authorized agent from the car or motor vehicle in which originally loaded.

(p)(2)(a) Except on class A, class C, or class D poisons, labels are not required on less-than-truckload shipments by motor vehicle by public highway when the articles are readily identifiable by reason of type of container or when the container is plainly marked to indicate its contents and;

(b) When the shipment is transported from origin to destination without transfer between vehicles and;

(c) When the shipper or its employes are in direct control or perform the loading, transporting and unloading.

The purpose of this amendment is to clarify meaning and provide further exemptions in labeling requirements.

A new specification container has been authorized by the Interstate Commerce Commission. This container is ICC 5M and must be constructed of monel. The container must comply with specification 5A except as follows:

SPECIFICATION 5M
MONEL DRUMS

Removable head containers not authorized.

Containers must comply with specification 5A except as follows (paragraph references are to specification 5A):

3. Composition.—Material must be, except for rolling hoops and chime reinforcements, monel.

4. This paragraph does not apply.

6. Chime reinforcement. — Containers to have chime reinforcement adequate for its protection.

7. Parts and dimensions:—As follows:

Marked Capacity Not Over (gallons)	Type of Container	Minimum Thickness in the black (Gage, U.S. standard)		Rolling Hoops Type
		Body Sheet	Head Sheet	
10	St. side	14	14	None

11. (a) ICC-5M. This mark shall be understood to certify that the container complies with all specification requirements.

13. Type tests.—Samples, taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every 12 months. Samples last tested to be retained until further tests are made. The type tests are as follows: (See spec. 5A).

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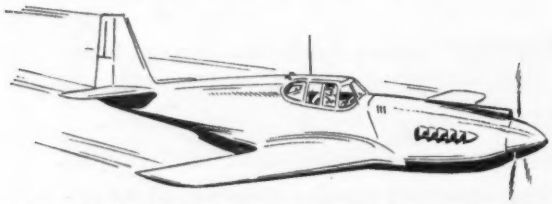

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PLANT OPERATIONS NOTEBOOK

NOMOGRAPH-OF-THE-MONTH

Edited by DALE S. DAVIS

Readers are invited to submit for publication in this department any original nomographs pertaining to chemistry or engineering. $10 will be paid for each one used.

Nomographs for Chemical Kinetics—I

by Melvin Nord
Wayne University, Detroit, Mich.

DETERMINATION of the order of a reaction can be made by graphical or numerical differentiation of data on concentration (or number of moles) vs. time to obtain reaction rates, after which the value of the specific reaction rate constant can be calculated or determined graphically. The reaction order can also be determined graphically from integral equations by plots of various types.[1] Either of these methods is time consuming.

It is possible by means of nomographs to determine the reaction order of simple reactions with minimum of calculations and in a very short time. The following series of nomographs accomplishes this.

Consider a general rate equation in concentration units for the reaction:

$$aA + bB + \ldots \rightarrow rR + sS + \ldots, \quad (1)$$

the rate equation being

$$\frac{-dC_A}{d\theta} = kC_A^a C_B^b \quad (2)$$

if the reaction is of simple order.[2] The sum of the coefficients in Equation 1 is the "molecularity" of the reaction; the sum of the exponents in Equation 2 is the "order" of the reaction. If the molecularity and the order are the same, the reaction is said to be of simple order. The order of a reaction is not determinable merely by adding the coefficients in the stoichiometric reaction equations, as is evident from the fact that the coefficients of the stoichiometric equation may all be multiplied by a given number without affecting the validity of the equation. Therefore, Equation 1 must represent not merely the stoichiometry of the reaction, but the actual mechanism, if it is to give information regarding the molecularity of the reaction.

Constant-Volume, Irreversible, Batch Reactions with a Single Reactant

If there is only one reactant, Equation 2 will become one of the following equations, depending on the reaction order:

First Order, ($A \rightarrow \nu R$):

$$\frac{-dC_A}{d\theta} = kC_A \quad (3)$$

Second Order, ($2A \rightarrow \nu R$):

$$\frac{-dC_A}{d\theta} = kC_A^2 \quad (4)$$

Third Order, ($3A \rightarrow \nu R$):

$$\frac{-dC_A}{d\theta} = kC_A^3 \quad (5)$$

Reaction orders above the third are not encountered in chemical kinetics because of the extremely low probability of four or more molecules meeting simultaneously. Note that Equations 2 to 5 assume that changes in concentration occur only because of changes in the mass of each component, attributable to the reaction, and not because of any changes in volume, i.e., these equations are valid only for constant volume reactions. Reactions that are not at constant volume will be discussed in a subsequent paper.

Integrated forms of Equations 3 to 5 are:

First Order,

$$\log \frac{C_{A_0}}{C_A} = \frac{k\theta}{2.303} \quad (6)$$

Second Order,

$$\frac{1}{C_A} - \frac{1}{C_{A_0}} = k\theta \quad (7)$$

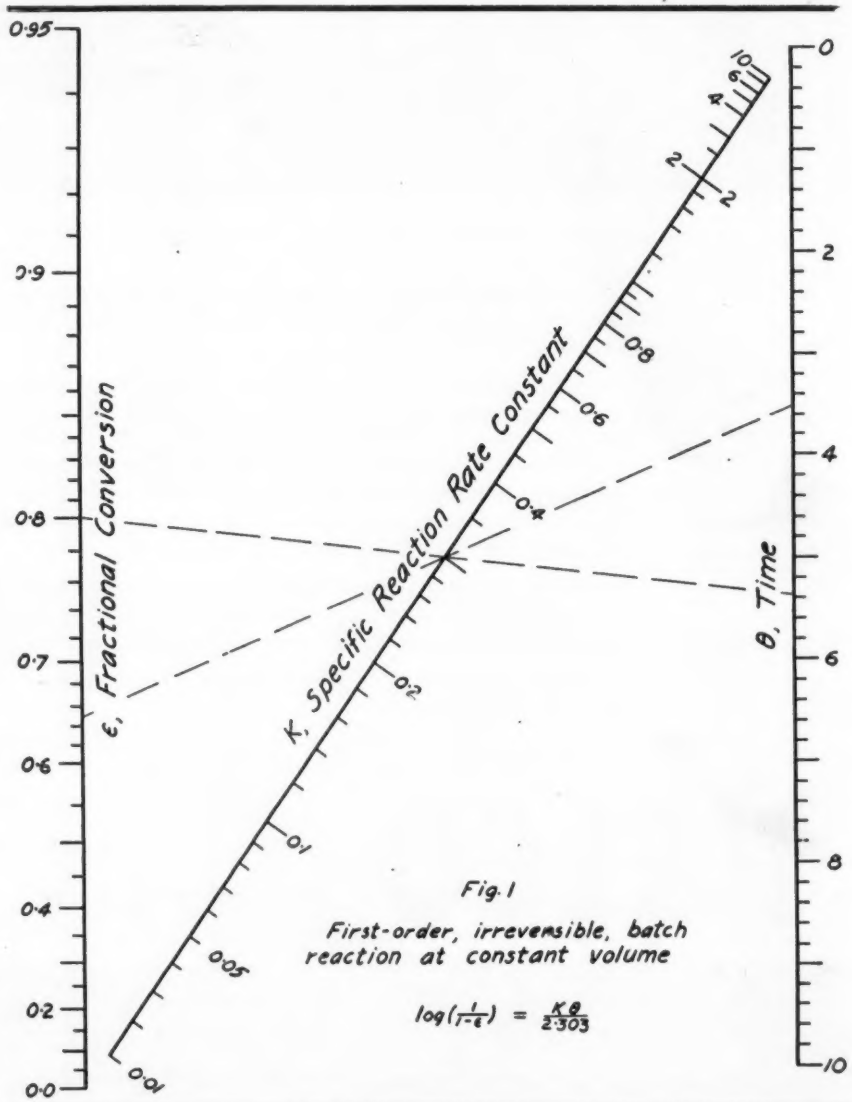
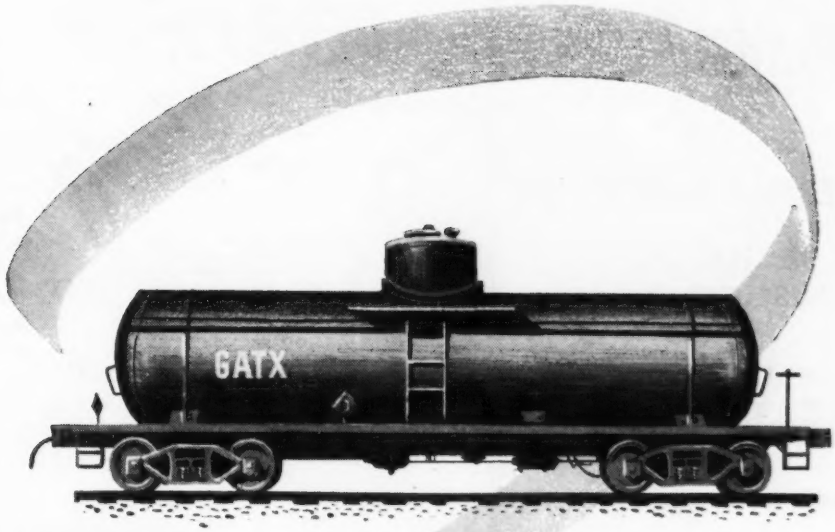


Fig. 1

First-order, irreversible, batch reaction at constant volume

$$\log\left(\frac{1}{1-\epsilon}\right) = \frac{K\theta}{2.303}$$



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Third Order,

$$\frac{1}{C_A^2} - \frac{1}{C_{A_0}^2} = 2k\theta \qquad (8)$$

Note that

$$C_A = \frac{n_A}{V} \qquad (9)$$

and

$$C_{A_0} = \frac{n_{A_0}}{V} \qquad (10)$$

and write

$$n_A = (1 - \varepsilon)n_{A_0} \qquad (11)$$

where ε is the fractional conversion. Equations 12 to 14 then follow in place of Equations 6 to 8:

First Order,

$$\log\left(\frac{1}{1-\varepsilon}\right) = \frac{k\theta}{2.303} \qquad (12)$$

Second Order,

$$\frac{\varepsilon}{1-\varepsilon} = kC_{A_0}\theta \qquad (13)$$

Third Order,

$$\frac{}{1 - \frac{(1-\varepsilon)^2}{(1-\varepsilon)^2}} = 2kC_{A_0}^2\theta \qquad (14)$$

Equations 12 to 14 are in the form

$$f(\varepsilon) = (\text{constant})\theta \qquad (15)$$

so that if the appropriate functions of ε were plotted as ordinates against θ as the abscissa, a straight line would result for Equation 12 if the reaction is of the first order, and so on. It is more convenient, however, to make these calculations once and for all and to plot the results in the form of a nomograph than to repeat these calculations for each reaction as the occasion arises in practice.

Figure 1 is a nomographic solution of Equation 12 for first-order, irreversible, batch reactions where there is only one reactant ($A \rightarrow \nu R$). The broken lines show the use of the chart. Suppose, for a given reaction, the data show that at $\theta = 3.51$, $\varepsilon = 0.65$, and at $\theta = 5.37$, $\varepsilon = 0.80$. Upon drawing the two broken lines, which represent these data, it is found that they intersect on the scale maked "k, Specific Reaction Rate Con-

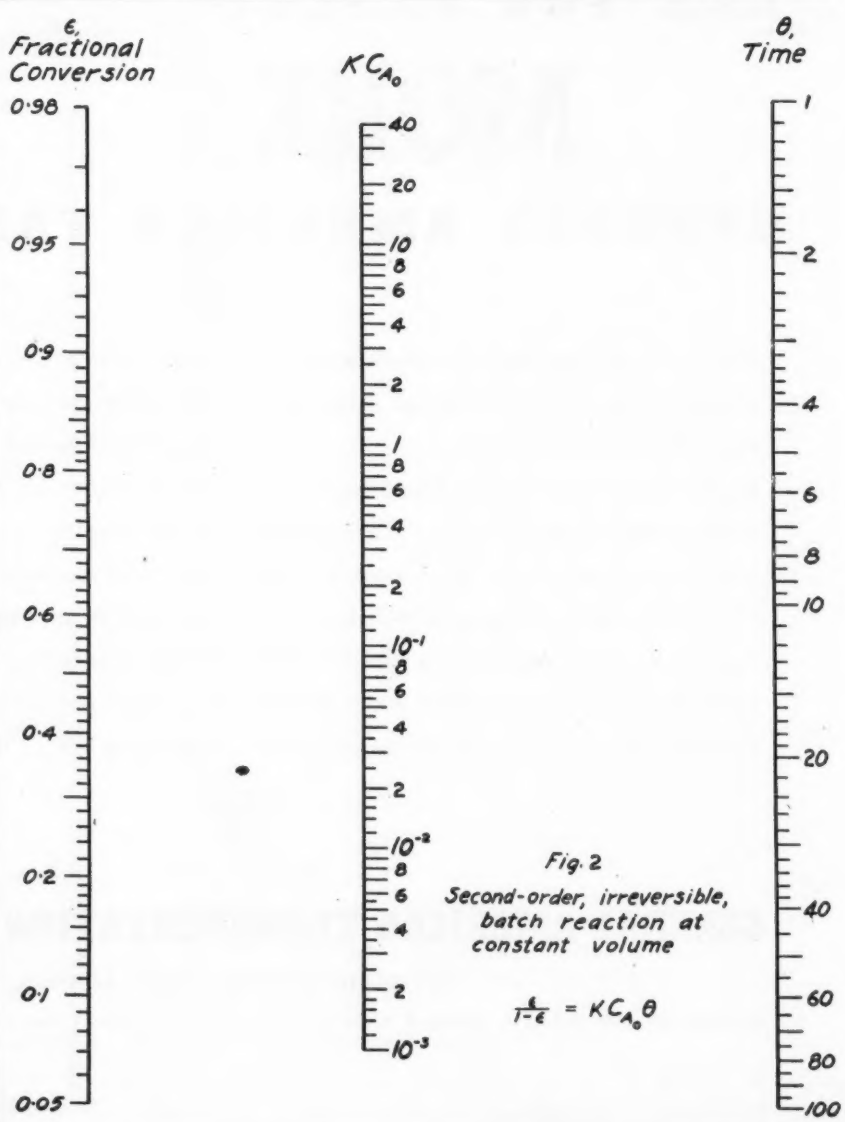
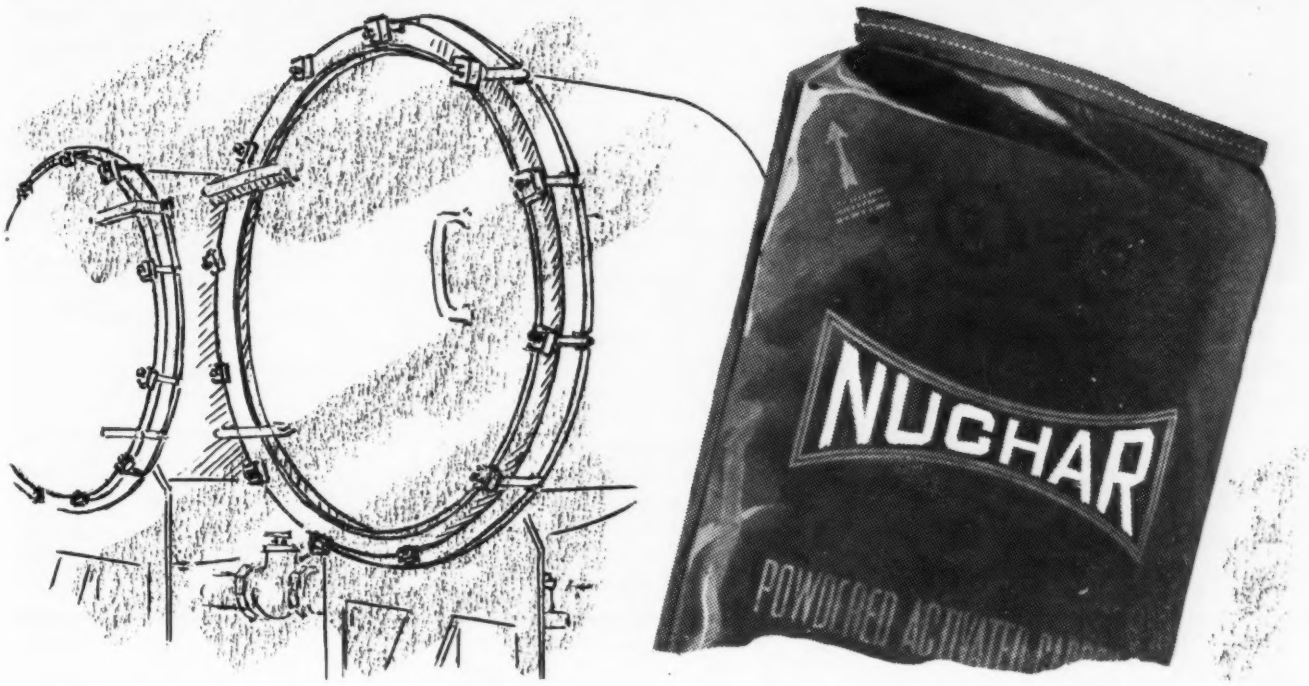


Fig. 2
Second-order, irreversible, batch reaction at constant volume

$\frac{\varepsilon}{1-\varepsilon} = KC_{A_0}\theta$

Reclaim Waste Products



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Nuchar Activated Carbon is produced in more than 50 standard grades, each "tailor made" to meet a specific industrial purification condition. If you are contemplating using powdered activated carbons, call in a Nuchar Technician. Activated Carbons are very selective and he will be glad to recommend the proper grades of Nuchar to give you the best results at an actual saving in carbon costs. Large scale production allows us to build into Nuchar Activated Carbon greater adsorptive activity per dollar cost.

Write to our nearest office today and arrange to have a Nuchar Representative call on you.

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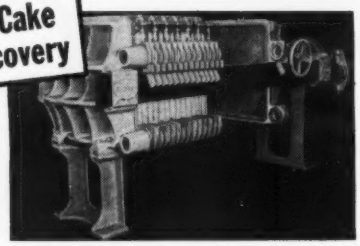
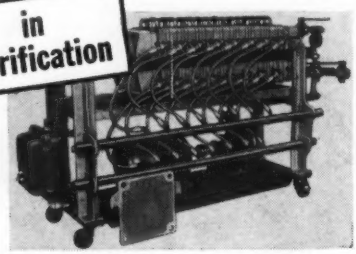
LOWER COST OPERATION

in Cake Recovery



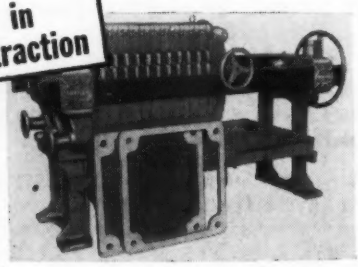
They produce filter cakes of any size, thickness and number, built up at any required pressure; firm, and dry enough to process or dry in subsequent equipment.

in Clarification



They produce in any desired volume at any flow rate, liquids of crystal clarity and purity, at any temperature or pressure, regardless of viscosity, thickness or color of slurry.

in Extraction



They produce filter cake that can be partially or thoroughly washed, steamed, extracted, leached, redissolved or melted right in the filter press.

Shriver Filter Presses are built of any material to process 1,000 gallons of slurry, for any pressure to 1,000 p.s.i., using any filter medium. Match that kind of design and performance versatility with any other kind of processing equipment, if you can.

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stant" at a value of 0.30. If all the data give lines that intersect at a single point on the k-scale, the reaction is of the first order and the value of k is given by the point of intersection. If there is no single intersection point, the reaction is not of the first order. If there is a single intersection point, but it is *not* on the k-scale, the reaction is still not of the first order but there is an indication that an empirical equation for ε vs. θ might be obtained by plotting log log $(1/1 - \varepsilon)$ vs. log θ and by determining the slope of the resulting straight line. Essentially, this situation shows that instead of Equation 15 being applicable, the empirical equation is of the type:

$$f(\varepsilon) = (\text{constant})\,\theta^m \qquad (16)$$

where the exponent m is empirical.

Figure 2 is the corresponding nomographic solution of Equation 13 and Figure 3 represents Equation 14. If a single-point intersection is found on the center scale of either of these charts, the reaction order is determined. If a point of intersection is obtained *off* the center scale, the empirical Equation 16 is applicable and must always be employed.

It should be noted that no units for the k and θ scales are specified on these nomographs and that the ε scale is dimensionless. Any convenient time units may be employed, such as hours, minutes, seconds or even units such as 10^2 hours.

Nomenclature

- C_A = molal concentration of component A at time θ
- C_{A_0} = initial molal concentration of component A
- k = specific reaction rate constant
- m = empirical exponent
- n_A = moles of component A
- n_{A_0} = initial moles of component A
- V = volume of system
- ε = fractional conversion
- θ = time
- νR = any products of an irreversible reaction

Literature Cited

1. Hougen, O. A. and Watson, K. M., "Chemical Process Principles", Part III, p. 822, New York, John Wiley and Sons, Inc.,1947.
2. Ibid., p. 820.

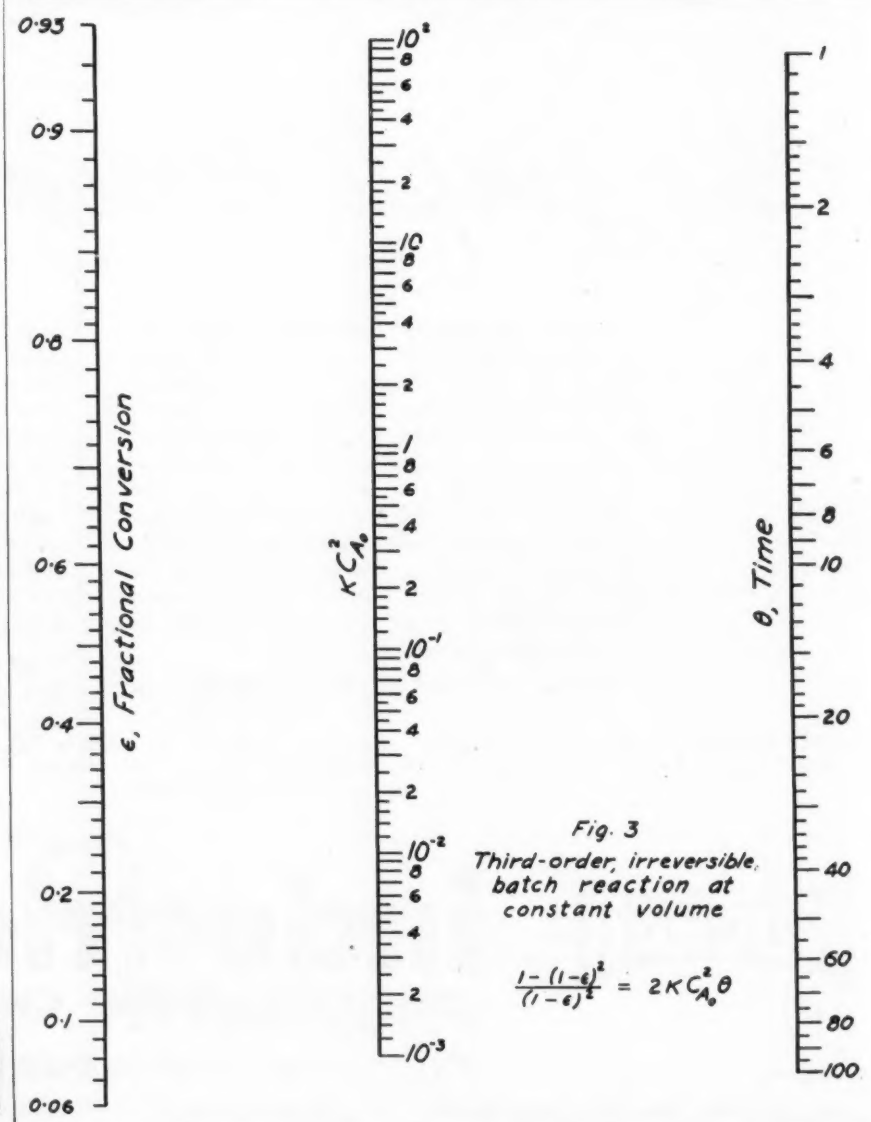

Fig. 3
Third-order, irreversible batch reaction at constant volume

$$\frac{1-(1-\varepsilon)^2}{(1-\varepsilon)^2} = 2KC_{A_0}^2\theta$$

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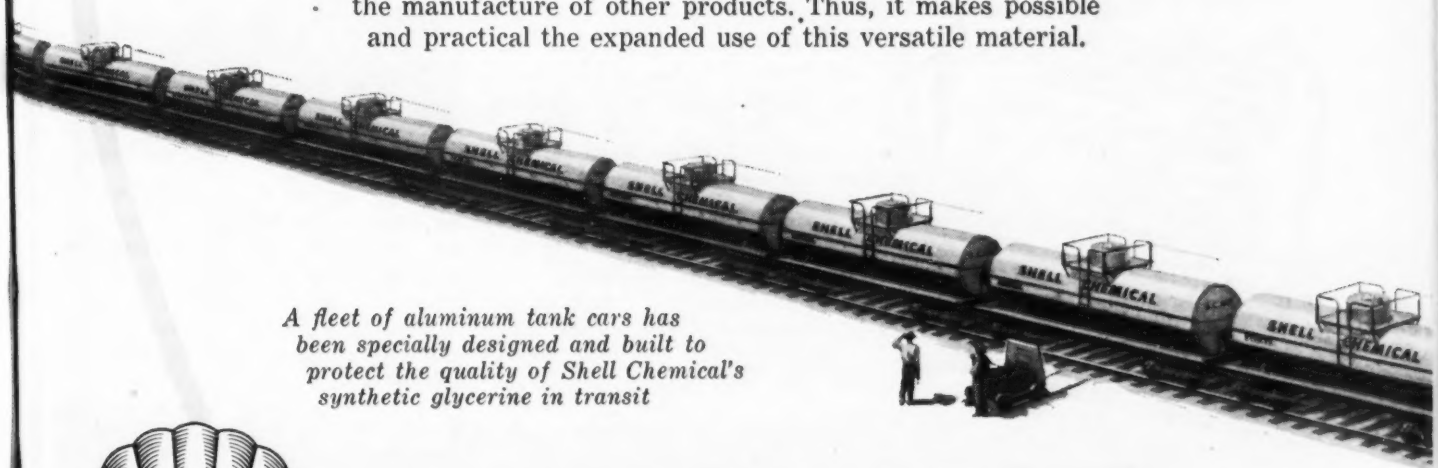

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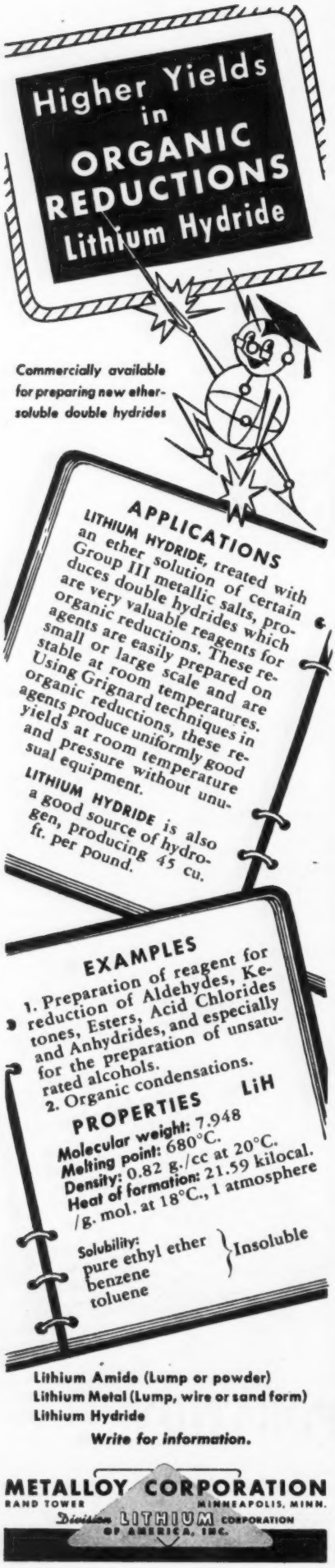
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LITHIUM HYDRIDE, treated with an ether solution of certain Group III metallic salts, produces double hydrides which are very valuable reagents for organic reductions. These reagents are easily prepared on small or large scale and are stable at room temperatures. Using Grignard techniques in organic reductions, these reagents produce uniformly good yields at room temperature and pressure without unusual equipment.
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LABORATORY NOTEBOOK

Electrolysis Power Source

A new constant voltage power supply for use in certain electrolytic determination and separation processes has been developed by the Electronic Instrumentation Laboratory of the National Bureau of Standards, Washington 25, D. C. This device, operating from a 110 volt A. C. line, supplies a stabilized and continuously adjustable D. C. voltage at current demands up to two amperes or more. Regulation is maintained with respect to a reference potential electrode, a useful means of selectively depositing only those metals that it is desired to remove in electrolytic separation.

Electrolysis has been used extensively for the separation and determination of certain elements, particularly copper and lead. Another application consists in removing a large variety of metals from a solution so that the remaining constituents may be subsequently determined by by some other method. Thus in the determination of aluminum in steel, the mercury cathode serves to remove iron and certain alloying constituents which might be interfering in the actual performance of the analysis.

In most of the above applications the selectivity of the process is determined by the type of solution in which the electroylsis takes place. Procedures using the more selective method of controlling deposition potential have been limited by the lack of suitable equipment to furnish and maintain the constant voltage required. Although several devices have been built, they are not entirely suitable because of mechanical features which render their performance uncertain due to such factors as fouling of contacts, or because the electronic circuits used do not permit control under all conditions of operation. The deficiencies of previous instruments are eliminated by this new power source.

Gas Cooler

A weighed sample is heated in an oxygen atmosphere. The carbon combines with the oxygen to form carbon dioxide. The gases from the sample are collected in a glass burette and the carbon dioxide gas is absorbed in a solution of potassium hydroxide. The reduction in gas volume, due to absorption of carbon dioxide, is read on the burette as percentage of carbon in the sample.

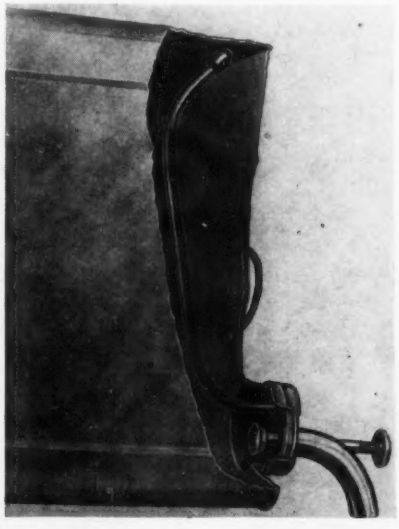
The carbon determinator tends to operate at room temperature while the incoming gas from the combustion furnace is above room temperature.

To cool the incoming gases to room temperature, they are passed through small diameter stainless-steel tubing. This tubing is in a field of air current from a blower fan connected to an electric motor. With this arrangement, the incoming gases are brought to the same temperature at which the volume measuring parts of the carbon determinator operate, and greater accuracy in carbon determination is made possible. The gas cooler is marketed by the Harry W. Dietert Co., 9330 Roselawn Ave., Detroit, Mich.

Spigot for 5-Gal. Cans

The Klix Speedy Spigot for dispensing fluids from standard 5 gallon cans, has been developed by Scientific Glass Apparatus Co., Inc. of Bloomfield, New Jersey.

This spigot is made principally of copper, cadmium-plated for corrosion resistance. A positive-seating lapped stainless steel plunger simplifies operations. A feature is the air inlet tube, equipped with a ball valve for free passage of air into the can, yet sealing the vent against the escape of liquids and vapors. Each spigot is furnished with two adapters to fit either of the popular thread variations on cans with 1¾" openings. Other adapters are available as required.



To operate a Speedy Spigot, pressure is applied to the thumb-button, opening the plunger. Air enters the vent tube, opening the automatic ball valve at its upper end. When the desired quantity of liquid has been drained, pressure is released and a strong spring seats the plunger, immediately halting all flow. At the same time the ball valve drops into place, sealing the air inlet against liquid or vapor escape.

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The Fisher Isotemp Oven is an outstanding, well-constructed, gravity-convection oven that provides both constant and uniform temperatures throughout the entire oven chamber. Its heating range is 35° to 200° C. and a sensitive thermostat permits control of the average temperature of the oven chamber within ±0.5° C.

The oven chamber is 12 inches square by 12½ inches deep, is constructed entirely of heavy sheet aluminum, and provides a total, useful, three-shelf area of 430 square inches.

The nickel-chromium heating elements are embedded within a refractory material outside the oven chamber, and the thermostat contacts are sealed inside a metal capsule.

Furnished with three shelves and 75° to 200° C. thermometer for 115 volt A.C., or for 230 volt A.C.....**$125.00**

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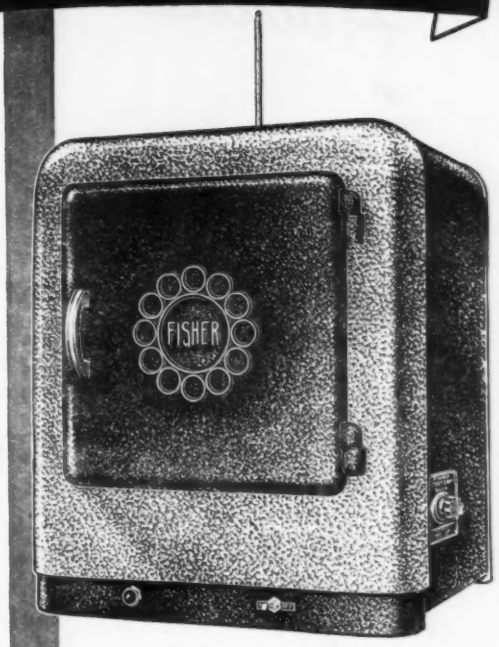
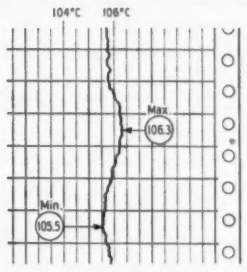
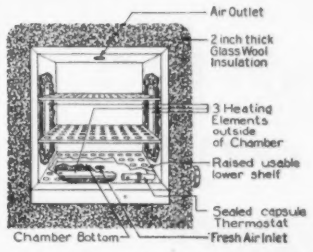


The Isotemp Oven has a cast aluminum frame; it serves equally well for heating, drying and sterilizing.

Placement of heaters, complete insulation and high thermal conductivity of aluminum interior result in uniform temperature on all three shelves—front to back.



Temperature recorder chart of Oven shows close control—within ±0.5° C.



Drawing shows insulating and design features that insure efficient and safe operation of the Isotemp.

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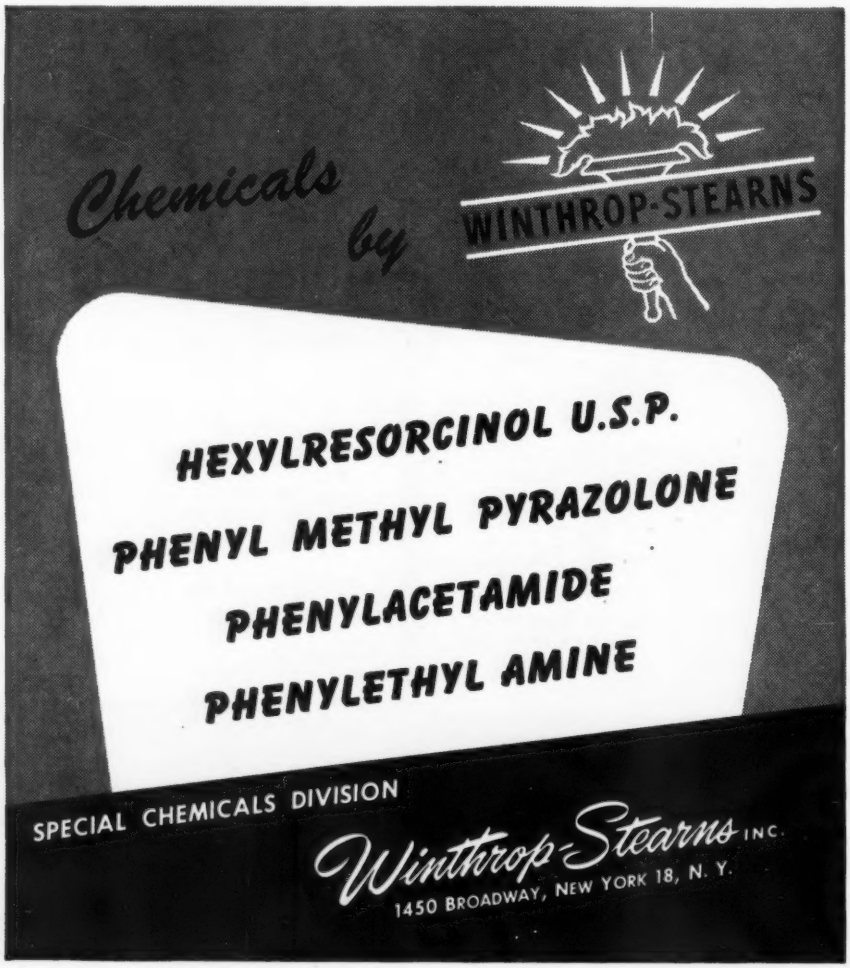

New Products and Processes

(*Continued from page 638*)

tories have developed a non-solvent method of hydrolyzing ethyl silicate. This process eliminates the mutual solvent and thus lowers the cost and removes the fire hazard.

Transparent Plastic NP 784

Tennessee Eastman Corp. is producing Tenite II (cellulose acetate butyrate) in a new crystal-clear transparency which is expected to broaden the applications of that plastic to include products which require transparency approaching optical clarity. The product is made by a new process which has also made possible paler, more delicate tints, of transparent colors than before. Color matches will henceforth be more accurate, with greater uniformity from lot to lot. The compatability with laquers is of interest in packaging.

Indium-Lead Alloy Solder NP 785

Soldering Specialties announces the introduction of its new #50 Solder Alloy. This new indium-lead alloy, which contains no tin, was developed to meet the demand for a solder with a melting point midway between those of the tin-lead solders and brazing alloys.

The new solder melts at 600° F., exhibits an extremely short plastic range, and has an exceptional wettability factor. Extensive premarketing tests indicate a holding strength of 3500 pounds psi, and a tensile strength of 5200 pounds.

Pure Titanium Tetrachloride

About 30,000 pounds of commercial titanium tetrachloride have been successfully purified through a distillation process developed by the Bureau of Mines.

Pure titanium tetrachloride, which was obtained in pilot-plant tests, is the basic raw material needed for production of metallic ductile titanium. This new bureau-developed metal is a promising light-weight structural material with excellent corrosion resistance comparable in many cases to stainless steel.

Commercial titanium tetrachloride is generally a reddish-yellow liquid containing certain impurities, such as silicon tetrachloride and small amounts of iron, vanadium, and molybdenum. These impurities were removed by the Bureau through a pre-distillation treatment with copper powder, which eliminated objectionable colors. Subsequent distillation then permitted the recovery of high-purity titanium tetrachloride.

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Chemicals and Insects

CHEMICAL INSECT ATTRACTANTS AND REPELLENTS *by Vincent G. Dethier.* Blakiston Company, Philadelphia, 1947. 289 pp., 21 fig., $5.00. Reviewed by G. Allen Mail, Boyle-Midway, Inc.

RESEARCH workers, students and teachers will welcome the appearance of this small but meaty text. Little is known regarding the mechanism by which insects are attracted or repelled or the stimuli that serve to activate feeding, sex or oviposition impulses, but Dr. Dethier in this concise volume has assembled much of the scattered literature on the subject.

The subjects covered in the ten chapters range from general discussions of the nature of chemical attractants and repellents to more specific analyses of essential oils, fermentation products and protein and fat decomposition products. Techniques for accumulating significant data by the use of olfactometers, baits, traps and other means are described, and Dr. Dethier points out weaknesses in the methods and suggests lines of future research that might be profitable.

The great economic importance of the subject makes further intensive research a necessity and the author, by bringing together the literature dealing with the chemical, physical, physiological and botanical factors involved has propounded problems, the solution of which will be of tremendous value, not only to agriculture but to industry. Besides the subject and author index at the end of the book, each chapter is followed by a full list of pertinent references.

This book is a distinct contribution to our knowledge of insect attractants and repellents and the author is to be congratulated on his excellent presentation of the subject.

For Engineers

CHEMICAL PROCESS PRINCIPLES, *by O. A. Hougen and K. M. Watson;* Part II (Thermodynamics) pp. 437-804; Part III (Kinetics and Catalysis) pp. 805-1107. John Wiley and Sons, Inc., New York. Prices: Part II $5.00, Part III $4.50. Reviewed by Herman W. Zabel, Engineering Editor, CHEMICAL INDUSTRIES.

THE TWO volumes, together with the earlier Part I (Material and Energy Balances), are after the style of the authors' well known "Industrial Chemical Calculations." The three books are essentially one, although the progressive inclusion of higher mathematics from parts one to three makes the latter more suitable for postgraduate students and practicing engineers.

Part II is a review of the thermodynamic problems of the process industries with particular emphasis on practical methods applicable to process design when a minimum of experimental data is available. To this end new generalizations are presented for approximating some thermodynamic properties from a minimum of data.

Part III is a survey of chemical kinetics as applied to reactor design for nearly all types of reactions: homogenous, heterogeneous, and catalytic. The principles of the theory of absolute reaction rates, which have led to the thermodynamic approach to kinetic problems, have been developed to the point of practical applicability. Especial attention has been given to interpretation of pilot-plant data.

The style is clear, terse and pleasing; the charts were designed with care and are uncrowded. The preface is informative, the bibliography is quite complete and indexing is satisfactory. The cover is exceptionally attractive, the paper is heavy and miraculously pre-war in quality and the book, of which author and publisher may well be proud, is remarkably free from typographical blemishes.

BOOKS RECEIVED

AN INTRODUCTION TO COLOR, *by Ralph M. Evans.* John Wiley & Sons, Inc. $6.00.

CALCULATIONS OF QUANTITATIVE ANALYSIS, *by Philip W. West.* The Macmillan Co. $2.75.

THE CHEMICAL WARFARE SERVICE IN WORLD WAR II, *prepared by the Chemical Corps Association.* Reinhold Publishing Corp. $4.00.

PREPARATION AND CHARACTERISTICS OF SOLID LUMINOUS MATERIALS, edited by Gorton R. Fonda and Frederick Seitz. John Wiley & Sons, Inc. $5.00.

DISTILLATION AND RECTIFICATION, *by Emil Kirschbaum.* Chemical Publishing Co., Inc. $10.00.

HEAT CONDUCTION WITH ENGINEERING AND GEOLOGICAL APPLICATIONS, *by Leonard R. Ingersoll, Otto J. Zobel, and Alfred C. Ingersoll.* McGraw-Hill Book Co. $4.00.

Colloid Chemistry

MODERN COLLOIDS *by Robert B. Dean.* D. Van Nostrand and Company, New York, 1948; 300 pp., $3.75. Reviewed by P. C. Herzog, laboratory section chief, Glidden Co.

DR. DEAN has prepared a concise, accurate and thorough review of the colloid field for those not specializing in this particular branch of science.

His objective is stated—"to serve as an introduction to the behavior of colloidal materials." He has accomplished this goal very well by logically reviewing the scope of interest and proceeding to cover, in twelve concentrated chapters, the major phases of colloid science with startling thoroughness. His coverage extends from methods of measurements to ionic absorption, plastics, rubbers, proteins, emulsions, colloidal ions and lyophobic colloids. He has wisely avoided long disertations on theory and has quoted accepted sources for further reference if needed. Unusual, in books intended primarily for academic courses, are the many practical applications used for some of the phenomena.

The book is well bound with an adequate index and is replete with many illustrations, schematic drawings and Hirschfelder models in addition to the usual structural formulas.

The reviewer was highly interested in this book and suggests that it is excellent for many in the field of colloid science. We believe Dr. Dean has completed a fine volume for those not expecting too great detail in an accurate review of this complex subject.

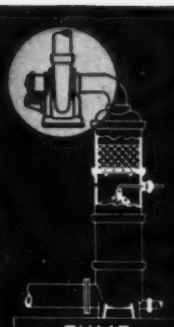
Nomographs

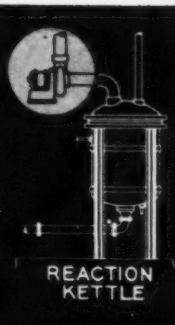
NOMOGRAPHY, *by Alexander S. Levens.* Published by John Wiley and Sons, Inc., New York 1948; 176 pages. Price $3.00. Reviewed by D. S. Davis.

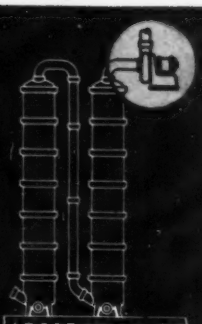
NEARLY any seasoned nomogramaniac who examined Levens' "Nomography" without reading the title page would be sure that Professor Lipka had managed somehow, after thirty years and from the Other Side, to revise, brighten and streamline the portion of his "Graphical and Mechanical Computation" (John Wiley and Sons, 1918) that constituted the first worthwhile American text on alignment charts. In organization of material, nomenclature, type forms and practical problems the two books are markedly similar, yet in a gratifying rather than disturbing manner.

Pointing out that ingenuity of the designer determines, in large measure, the amazing combinations of the various forms of nomographs, the author provides, as did Lipka, many valuable type forms and illustrates adequately their application to well-known engineering problems. His wide experience as teacher and engineer has left him no choice, consistent

THESE FANS...


FUME WASHER


REACTION KETTLE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DURIRON, of which standard Durco fans are made, is a high-silicon iron alloy containing approximately 14.5% silicon. It is highly resistant to the corrosive attack of all commonly used acids except hydrofluoric, sulfurous and oleum.

DURICHLOR is a high-silicon alloy, similar to Duriron, developed by Durco for resisting the corrosive action of hydrochloric acid below boiling point. It is similar to Duriron in resistance to other corrosives except that is superior for chloride solutions and chlorine gas.

DURIMET is a patented low carbon stainless steel containing nickel, chromium, molybdenum and copper. Durimet fans will safely handle the fumes of oleum, sulfurous acid, sulfur dioxide and hydrofluoric acid.

In addition to their extraordinary corrosion-resisting ability, Durco fans have many features of construction which permit:

- Easy access to all parts.
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- Removal of motor without disturbing fan connections.
- Rotation of volute to change direction of discharge.
- Minimum of maintenance. Most of the operation attention is confined to oiling the motor.

New Fan Bulletin No. 1102 gives complete information and engineering data. Write for your free copy.

DURCO Adv. 22-GM

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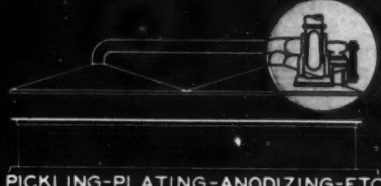
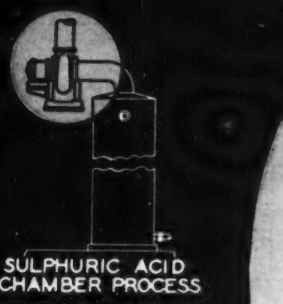
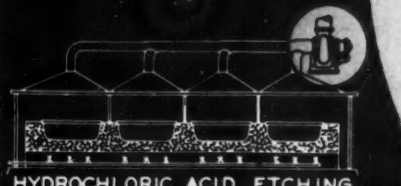

PICKLING-PLATING-ANODIZING-ETC.


SULPHURIC ACID CHAMBER PROCESS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with practicality and clarity, but to employ the geometric approach to nomography. Out of the goodness of his heart, though, he has appended a better chapter on the determinant method than many that appear in British and American texts devoted wholly to this somewhat obscure phase of the subject.

Definitions and special techniques are introduced as they are needed, the impetuous student is flagged down with warnings at just the right points and the proofs are given in sufficient detail to be followed readily. Effective and actual moduli are clearly differentiated, but practicing nomographers are not likely to agree with the author's recommendations as to maximum and minimum spacing of graduations and length of the strokes. The traditional English rather than the more convenient metric system is retained for constructing the charts and no mechanical aids, favored by industrial nomographers, are suggested or provided. The illustrative examples and the 127 problems drawn from mechanical, electrical, civil, chemical and aeronautical engineering and from the fields of hydraulics, production, business and statistics seem to be well chosen, for the most part, although better examples of nomographs of particular interest to chemists and chemical engineers could have been found with ease. Some of the problems are a little jaded and shopworn: numbers 30, 70, 79, 92 and 119, also appear in Lipka's book; problems 78 and 79 are found in Mavis' "The Construction of Nomographic Charts" (Scranton, Pa., International Textbook Co., 1939) and a better illustration of a recurrent variable type of equation than the ubiquitous $w^2 + pw + q = 0$, also given by Lipka and by Van Voorhis in his "How to Make Alignment Charts" (New York, McGraw-Hill Book Co., 1937), is needed.

The chapter headed "Practical Short-Cuts in the Design of Alignment Charts" is a little disappointing. Nomographers who strive to keep their work on an undefiled basis will consider that resort to the methods described is neither necessary nor desirable when equations connecting the variables are known. They prefer to reserve these secondary but convenient techniques for data that have been related only by a table or a plot.

Throughout the book the illustrative examples, handled ably, tend to be less difficult than many problems likely to be encountered by chemical engineers, though such illustrations are probably well suited to those in other fields. The twenty-nine examples of alignment charts in the spheres of engineering, production, business and statistics found in the appendix do not include a recurrent variable type with a curved scale.

Organic Analysis

THE SYSTEMATIC IDENTIFICATION OF ORGANIC COMPOUNDS (3rd Ed.), *by Ralph L. Shriner and Reynold C. Fuson.* John Wiley & Sons, Inc., New York, 1948; 370 pp., $4.00. Reviewed by N. H. Marsh, chemist, Stamford Research Laboratories, American Cyanamid Co.

THE FIRST and second editions of this book established its position as a leader in the field of qualitative organic analysis. The third edition makes a strong bid to maintain that position.

Evidently every effort has been made to bring the third edition up-to-date and to eliminate certain weaknesses in organization found in earlier editions. Several new classification tests and derivative preparation procedures have been introduced. Among the new classification tests are those using nickel chloride, carbon disulfide, and ammonium hydroxide for secondary amines, nickel chloride and 5-nitrosalicylaldehyde for primary amines, and ferric hexathiocyanatoferrate (Ferrox) for oxygen-containing compounds. In addition, a water-ether partition coefficient determination for organic acids has been introduced to supplement the old Duclaux test. Unlike the Duclaux test, the solvent-partition method is not restricted to volatile acids. New derivative

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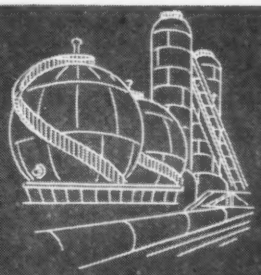

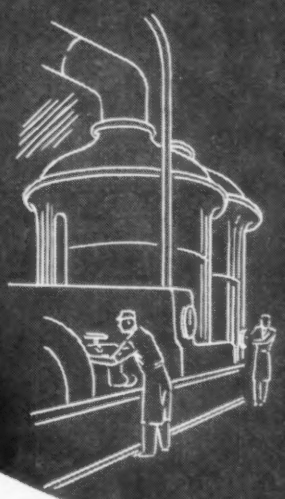

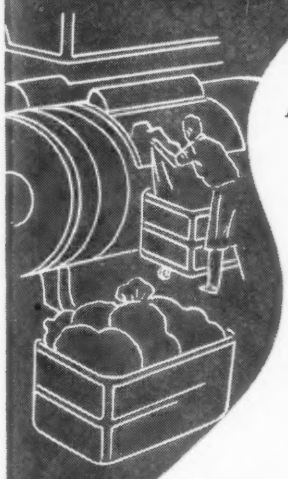

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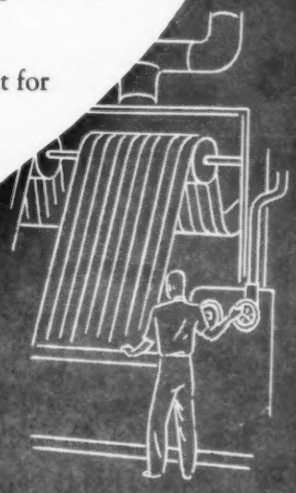

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preparation procedures include benzylthiuronium sulfonates for sulfonic acids, N-xanthylsulfonamides for sulfonamides, substituted phenylthioureas for nitriles (after reduction), benzylthiuronium alkyl hydrogen sulfates for alcohols, and phenylhydrazonium salts for acids. As in earlier editions, new tests and procedures have been introduced only after thorough testing to establish workability in the hands of students. A notable improvement in organization is the inclusion of melting points of solids and boiling points of liquids in the index. This change materially aids in the location of a given compound in the tables.

Organic Text

ORGANIC CHEMISTRY, *by Ray Q. Brewster.* Prentice-Hall, Inc., New York, 1948; 840 pp., $7.35. Reviewed by Dexter B. Sharp, assistant professor of organic chemistry, Kansas State College.

THIS VOLUME is a new departure in the field of elementary organic chemistry text books. The author has incorporated modern theories of organic chemistry into the context and employs these concepts liberally to explain the chemical and physical properties of organic compounds. Reaction mechanisms are presented in so far as they are known with reference to inductive or mesomeric effects, resonance, bond character, and bond energy. Physical properties are related, where possible, to dipole moments, hydrogen-bond associative forces, etc. It is predicted that this type of elementary text will give students of a full year course a flexible and logically based knowledge of organic chemistry, heretofore acquired only after additional course work.

The book is written well. The sections devoted to syntheses and chemical and physical characteristics of organic compounds are excellent. General topics such as optical isomerism, geometrical isomerism, and color and constitution have received very good treatment. Adequate space has been devoted to both aliphatic and aromatic organic chemistry. Brief but sufficient chapters serve as introductions to the chemistry of alicyclic, heterocyclic, and the lesser known nitrogen and sulfur containing organic compounds.

Inspection of the book reveals some deficiencies: There is a relatively large number of typographical errors, several of a serious magnitude from the viewpoint of the beginning student. The sections on nomenclature are too brief, in the opinion of this reviewer, and some instructors would want longer and more general sets of questions and problems than are presented in this text.

An attempt was made to examine this text from the standpoint of the beginning student but the reviewer hastens to add that it would serve equally well as a basic reference book of organic chemistry for the more advanced student.

Other Publications

CANADA'S NEW NORTHWEST, a study of the present and future development of Mackenzie District of the Northwest Territories, Yukon, northern Alberta and B. C. 155 pp., $1. The King's Printer, Department of Public Printing and Stationery, Ottawa.

ANNUAL REPORTS OF THE SOCIETY OF CHEMICAL INDUSTRY ON THE PROGRESS OF APPLIED CHEMISTRY. 518 pp. Society's offices: 56 Victoria St., London S.W. 1.

NATIONAL DIRECTORY OF COMMODITY SPECIFICATIONS, 1947 SUPPLEMENT, brings the 1945 edition of the directory up to date. 322 pp., $2.25. Superintendent of Documents, U. S. Government Printing Office, Washington 25, D.C.

DISTILLATION LITERATURE 1941-1945, an index and compendium of abstracts to facilitate literature searching, compiled by Prof. Arthur Rose, 525 S. Gill St., State College, Pa. $5.

GERMAN CHEMICAL REPORTS translated into English. Titles and prices available from publisher, Research Information Service, 509 5th Ave., New York 17, N. Y.

MOLYBDENUM: STEELS, IRONS, ALLOYS is the title of a 391-page book, containing 188 figures and 91 tables (plus appendices) distributed free of charge to metallurgists and others closely connected with the metallurgical industry by Climax Molybdenum Co., 500 5th Ave., New York 18, N. Y. It was published in July, 1948.

INDUSTRIAL AIR SAMPLING AND ANALYSIS, by Leslie Silverman, published by Industrial Hygiene Foundation, 4400 5th Ave., Pittsburgh

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ENGINEERS' COUNCIL FOR PROFESSIONAL DEVELOPMENT FIFTEENTH ANNUAL REPORT contains the generally-adopted canon of ethics for engineers together with informative reports of various Council committees and current accredited list of engineering curricula. 48 pp., 50c, from the Council, 29 W. 39th St., New York 18, N. Y.

ADVANCE HEADLINES is a new house organ for the protective coatings industry published by Advance Solvents & Chemical Corp., 245 5th Ave., New York 16, N. Y. Vol. 1, No. 1 is dated July, 1948.

GERMAN TECHNICAL DOCUMENTS, translated from microfilm and published, are available from Mapleton House, 5415 17th Ave., Brooklyn 4, N. Y. Titles and prices available on request.

INDUSTRIAL ELECTRONICS REFERENCE BOOK, prepared by Westinghouse engineers, contains 35 chapters and 680 pp. of basic electronic theory, design, application and maintenance of electronic equipment. John Wiley & Sons, 440 4th Ave., New York 16, N. Y., $7.50.

NEW GUIDE TO INDUSTRY RESEARCH, for wood technologists, containing many declasified wartime projects, is published by National Lumber Manufacturers Assn., 1319 18th St. N.W., Washington, D. C. $5.

HEALTH CONTROL AND INDUSTRIAL LEAD WORKERS is a compilation of three reprints pertinent to that subject. Lead Industries Assn., 420 Lexington Ave., New York 17, N. Y. 50c.

BIBLIOGRAPHY OF REPORTS CONTAINING ANALYSES OF CRUDE OILS BY THE BUREAU OF MINES ROUTINE METHOD. Free from Bureau of Mines, Publications Distribution Section, 5800 Forbes St., Pittsburgh 13, Pa.

PHYSICS TODAY is a new monthly publication of the American Institute of Physics that describes new developments for the non-specialist. $4 per year. Institute address: 57 E. 55th St., New York 22, N. Y.

INDUSTIAL WASTE DISPOSAL FOR PETROLEUM REFINERIES AND ALLIED PLANTS, by W. B. Hart. A reprint of 20 articles from Petroleum Processing, 1213 W. 3rd St., Cleveland 13, Ohio. 103 pp., $4 (12c more for Ohio purchasers).

BETTER FINISHING AND SURFACE PROTECTION is a new monthly house organ published by Brooklyn Varnish Manufacturing Co., 50 Jay St., Brooklyn 1, N. Y. It is distributed without charge to companies concerned with any phase of industrial finishing.

RECENT PROGRESS IN LAMINATED WOOD. Bulletin No. 22 of the Northeast Wood Utilization Council, Inc., P. O. Box 1577, New Haven 6, Conn. Eight papers on the utilization of second-growth timber by lamination; 72 pp. Price $2.

THE CHEMOTHERAPHY OF FILARIASIS. A 152-page illustrated monograph comprising 15 papers. New York Academy of Sciences, Central Park West at 79th St., New York, N. Y. Price, $2.50.

INDUSTRIAL HYGIENE NEWSLETTER. The Government Printing Office has recently placed this publication, of interest to those responsible for employee health and safety, on its list of subscription publications. Price per year, $1 (domestic), $1.25 (foreign). Address the U. S. Public Health Service, Washington 25, D. C.

CANADIAN TRADE INDEX, 1948 Edition, includes an alphabetical list of 10,000 manufacturers with addresses, branches, brands and trade names, a classified product directory, and an export section. Over 1,000 pp., $6. Canadian Manufacturers Assn., 67 Yonge St., Toronto 1, Ontario.

RESEARCH LABORATORIES OF THE PACIFIC NORTHWEST lists industrial companies doing research, commercial laboratories, and a classification of laboratories by types of projects conducted. Raw Materials Survey, 701 Woodlark Bldg., Portland 5, Ore. $2.

GEOLOGY AND MINERAL DEPOSITS OF BUMPASS COVE, UNICOI AND WASHINGTON COUNTIES TENNESSEE, by John Rodgers. History and economic appraisal of the mineral-rich region. Tennessee Division of Geology, G-5 State Bldg., Nashville. Price, $1.75.

THE CHEMICAL FORMULARY—Volume 8. Recently published volume of this well-known work by H. Bennett. 448 pp. Chemical Publishing Co., Inc., 26 Court St., Brooklyn 2, N. Y. Price, $7.

PLASTICS PRODUCTS INDUSTRY. One of a series on War Changes in Industry compiled by the U. S. Tariff Commission. Available from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at 25c.

DIRECTORY OF ENGINEERING DATA SOURCES. A 65-page compilation of where to find data in various fields of engineering. Southeastern Research Institute, Inc., 5009 Peachtree Rd., Atlanta, Ga. Price, $2.50.

OXIDATIVE CLEAVAGE OF OZONIDES (ca. 5,075 words), $17.75; SULFOCHLORINATION OF PROPANE IN SOLUTION (ca. 4,380 words), $15.30; OXIDATION OF PARAFFIN WAX (ca. 1,430 words), $5; HYDROGENATION OF WAX OXIDATION PRODUCTS (ca. 2,075 words), $7.25; CARBOXYLIC ACID DERIVATIVES FROM OLEFINS (ca. 1,475 words), $5.25. These are translations of Technical Oil Mission PC documents, available from Chas. A. Meyer & Co., Inc., 25 Vanderbilt Ave., New York 17, N. Y.

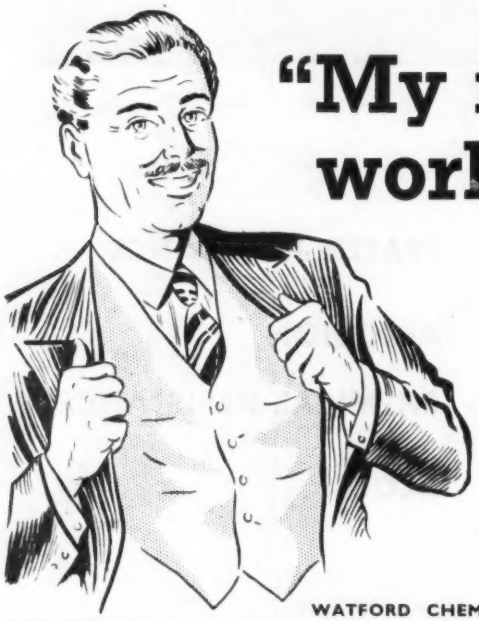
TECHNICAL OIL MISSION. A large number of documents have been translated by Consultants Bureau, 155 W. 33rd St., New York 1, N. Y. A complete list, showing prices per copy of the reports, is available from the above address.

NFPA HANDBOOK OF FIRE PROTECTION (Crosby-Fiske-Forster). 10th edition, edited by R. S. Moulton, 1500 pp.; price, $9.50. National Fire Protection Assn., 60 Batterymarch St., Boston 10, Mass.

PROCEEDINGS OF THE FOREST PRODUCTS RESEARCH SOCIETY—Vol. I. Papers presented at the 1st national meeting, membership directory and other features, 340 pp.; price, $6. Orders should be addressed to Thomas R. C. Wilson, Secy.-Treas., F.P.R.S., P. O. Box 2010, University Sta., Madison 5, Wis.

ATOMIC ENERGY LEVELS—Vol. 1. Sec. 1. Spectroscopic data for the first nine elements (hydrogen through fluorine) brought up to date. 75 pp.; price, 50c. By Charlotte E. Moore, National Bureau of Standards. Sold by Superintendent of Documents, G. P. O., Washington 25, D. C.

NATURAL GASOLINE AND THE VOLATILE HYDROCARBONS (Section 1) by Brown, Katz, Oberfell, and Alden. Four acknowledged experts in the petroleum field bring their previous books up to date in concise form. Price, $4. Natural Gasoline Association of America, Tulsa, Okla.



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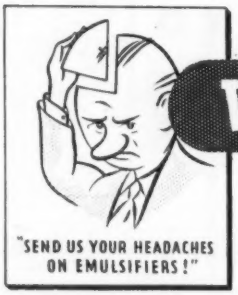

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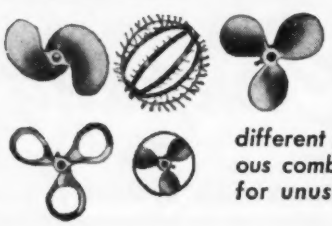

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NEWS OF THE MONTH

Resinous Products Merges With Rohm & Haas

Merger of The Resinous Products and Chemical Co. with the Rohm & Haas Company has been approved by the stockholders of both companies. The following officers were named: president, Otto Haas; executive vice-president, Duncan Merriwether; vice-presidents, C. E. Andrews, A. L. Blount, R. A. Connor, L. W. Covert, D. S. Frederick, E. L. Helwig, L. Klein; secretary, S. C. Kelton; treasurer, W. T. McClintock.

The relationship between the two firms prior to the merger had been very close. The controlling stock interest in both companies was held by the same group, and manufacturing and selling operations were interrelated.

Since its organization in 1926, The Resinous Products and Chemical Co. pioneered in the development and manufacture of synthetic resins for the coatings, plywood, paper and other industries. The business of Rohm & Haas was started in Philadelphia in 1909 to manufacture and sell Oropon, the original enzyme bate, and other products important to the leather industry. At present it manufactures products for the leather, textile, insecticide, plastics and other industries. Plants are operated at Philadelphia, Pa., Bristol, Pa., Knoxville, Tenn., and Houston, Texas.

Shell Completes Units In Current Expansion

Shell Chemical Corp.'s $12 million plant at Houston, Texas, for the manufacture of synthetic ethanol and other products has been completed and full scale production will begin soon. This synthetic ethanol will augment the supply of this alcohol by 18 million gallons. Although much ethanol is obtained by fermentation processes, the Shell process depends on the direct hydration of ethylene obtained from petroleum refinery operations.

All of Shell Chemical's synthetic alcohol, produced under strict supervision, will find its way into industrial applications. The presence of U. S. Treasury agents in the plant has given rise to the story that some of the production will go into whiskey. This is not so; they are there to make sure that none of it goes into taxable outlets. The product will be offered as a proprietary solvent under the trade-marked name of "Neosol" and in standard specially denatured grades approved by government authorities. Some of the many industrial applications of ethanol include formulation of lacquers and varnishes, manufacture of antifreeze solutions, processing of foods and vitamins, extraction of drugs, synthesis of dyestuffs, and manufacture of plastics, rayon, and cosmetics.

The ethanol unit is part of a $43 million expansion undertaken in 1946. A new multi-million dollar plant for methyl ethyl ketone and *sec*-butyl alcohol was put on stream at Houston recently, and the $8 million synthetic glycerine plant—the world's first—has just gone into production at the same location. Another plant utilizing the petroleum products of the area is the ethyl chloride unit that also will have ethylene as its raw material. This alkyl halide is expected to find wide application in organic synthesis for plastics and other materials.

Fiber A Now "Orlon"

The Du Pont Co. has adopted the trade-mark "Orlon" for a synthetic textile fiber on which it has been conducting research for several years, and which has previously been known only as Fiber A.

Technically the material is called a polyacrylonitrile fiber. Quantities required for the development work are being made in a laboratory-scale pilot plant. "Orlon" acrylic fiber offers some properties said to be outstanding contributions to the textile industry. Its resistance to degradation by sunlight commends it for use in awnings, automobile tops, and other outdoor uses. Resistance to chemical attack, particularly by acids, and ability to withstand elevated temperatures fit it for use in filtration applications and chemical-resistant cordage and threads.

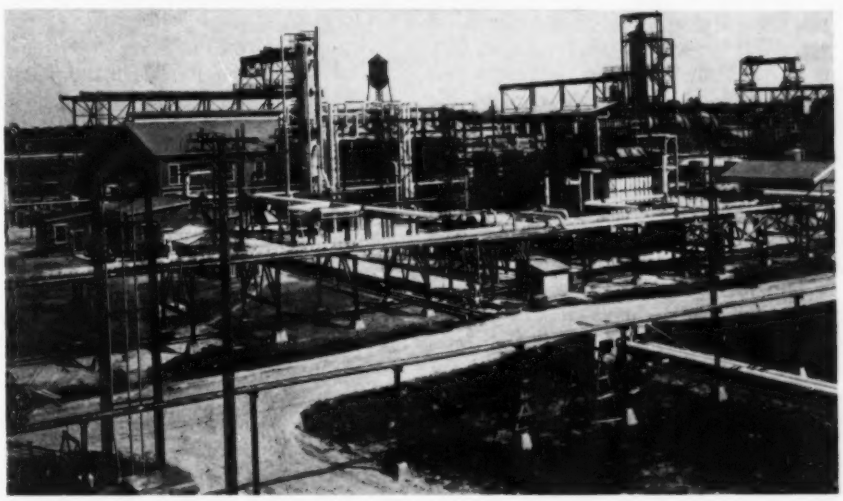
The development originated in the pioneering research section of the rayon department in 1940 when work was begun on vinyl type compounds and their possibilities for fibers and films.

Mines Bureau, Industry Cooperate on Shale Oil

Under cooperative agreements signed recently with 10 large industrial research organizations, the Bureau of Mines has agreed to supply limited quantities of oil shale and shale oil for tests and experimentation in exchange for information on the results obtained. Materials covered in the agreements, now totaling approximately 1,250 tons of shale and 320 barrels of oil, are being shipped from the Bureau's mines and demonstration plant on the Naval Oil Shale Reserves near Rifle, Colo.

Cooperating companies and institutions are the Sinclair Refining Co., New York, N. Y.; Standard Oil Development Co., New York, N. Y.; Union Oil Co. of California, Los Angeles, Calif.; Socony-Vacuum Oil Co., Inc., Paulsboro, N. J.; Shell Development Co., San Francisco,

New CSC Unit Begins Methanol Production



Production of methanol has begun at a new unit of Commercial Solvents Corp.'s Dixie Plant, Sterlington, La. This marks the completion of a $5 million expansion at this plant which has provided the company with 45,000 gallons daily additional methanol output.

Calif.; Phillips Petroleum Co., Bartlesville, Okla.; General Aniline and Film Corp., New York, N. Y.; Montana State College, Bozeman, Mont.; Gulf Research and Development Co., Pittsburgh, Pa.; and Godfrey L. Cabot, Inc., Boston, Mass.

Each of the 10 organizations has requested samples of shale oil for refining and other tests on the conversion of the crude oil into useful products. In addition, the Sinclair Refining Co., Standard Oil Development Co. and Union Oil Co. also are obtaining oil shale for research on the development of processes for extraction of the shale oil. Sinclair's work on oil shale will be done at the newly completed laboratories at Harvey, Ill., Standard's at Baton Rouge, La., and Union's at Wilmington, Calif.

The agreements provide that the cooperator shall furnish data on the results of tests and experiments and shall keep the Bureau informed of any important developments that arise during their progress. Either party may publish information relating to the economic evaluation of the test results, but detailed engineering and technical data shall be treated as confidential and will not be published without the written consent of the cooperator.

Companies or institutions desiring oil shale or shale oil for research under such cooperative agreements should write to Mr. Boyd Guthrie, Chief, Oil-Shale Demonstration Plant, Bureau of Mines, Rifle, Colo., giving full information as to the quantity desired, the purpose for which it is to be used, and the proposed arrangement for shipment. In the case of shale, the desired grade and particle size also should be stated. Form copies of the proper cooperative agreement will be returned for signature.

Standard Oil, Carbide Sign Gas Contract

Standard Oil Co. (Indiana) will supply billions of cubic feet of hydrocarbon gas, valued at approximately $75,000,000, from its Whiting, Indiana, refinery to the adjacent chemical plant of Carbide and Carbon Chemicals Corp., under terms of a new 15-year contract which has recently been drawn between the two companies.

Prior to 1935 substantially all such gases were burned as plant fuel, but since 1935 an increasing proportion has been sold to the chemical company for use as raw material in the production of a variety of chemicals, principally acetone, acetic anhydride, and alcohols. Under the new agreement, which will extend to 1965, the volume of gas delivered will be substantially greater than heretofore and will permit a sizable expansion of the production facilities in the Carbide plant.

The sale of this large volume of gas—consisting primarily of ethane, ethylene, propane, and propylene—illustrates the increasing importance of petroleum as a source of chemical raw materials. Standard's own chemicals program will utilize other liquid and gaseous petroleum fractions at its Whiting refinery as source materials, but a major share of Standard's activities in the chemicals field will be centered at its Wood River, Illinois, refinery. In addition, Standard's wholly owned subsidiary, the Stanolind Oil & Gas Co., will soon be engaged in extensive chemicals production in connection with hydrocarbon-synthesis operations at Brownsville, Texas.

Chemicals Wanted

The following chemicals are wanted by the National Registry of Rare Chemicals, Armour Research Foundation, 35 West 33rd St., Chicago 16, Ill.

Pyocyanin
Trifluoroethanol
2,2-Difluorohexane
1,1-Difluorohexane
Oleanolic acid
Hyodesoxycholic acid
4,7-Diaminodiphenylene oxide
Ethionic acid
Isopelletierine
Tungsten carbonyl
Titanium dichloride
Dihydrofuran
2,5-Dichlorostyrene
3,4-Dichlorostyrene
4-Chloromethylimidazole
Boron sulfide
Benzyl fluoride
3-Chloro-2-butanol
Germanochloroform
Tantalum boride

Monsanto Moves Lockport Plant

Monsanto Chemical Co. is moving its Lockport, N. Y. plant to the company's plastics division at Springfield, Mass., to assure greater efficiency in its manufacturing operations. The move hinges upon the completion of a new unit at Springfield for the production of formaldehyde, not only a raw material for the four types of formaldehyde resins manufactured at Lockport, but also essential for the production of certain resins currently made by the company's plastics division. The Lockport plant manufactures resins for the plywood industry, including urea formaldehyde, melamine formaldehyde, phenol formaldehyde and resorcinol formaldehyde.

The transfer involves several changes in the responsibilities of production department personnel. Carl T. King, Springfield production manager, will continue in his present position and will be additionally responsible for the coordination of activities in the company's foreign plants and for special assignments. The operation of the Springfield production department will be under the direction of Robert K. Mueller, assistant production manager. The phenolic plant will be under the direction of Kenneth M. Irey, plant manager. The continuous and sheet plant will be handled by William T. Dickens, assistant plant manager. John C. Garrels, Jr., formerly plant manager at Lockport, becomes plant manager of the thermoplastic plant.

Diamond Alkali Appoints McKenna

J. C. McKenna, named product manager of alkali sales for Diamond Alkali Co. He has been product manager of chromium sales.

Du Pont Lists Patents For Licensing

The Du Pont Co. is listing 4260 of its patents on the Patent Register of the U. S. Patent Office as available for licensing. The patents submitted are about two-thirds of the patents the company owns, and cover many phases of its diversified operations. This first official listing of Du Pont patents is expected to appear in an early issue of the Patent Office Gazette.

Study of the company's patents will be continued to determine what additional listings may be made from time to time, and patents not included in the present registration are not necessarily withheld from consideration for licensing. The present list was compiled only from patents granted since January 1, 1933, as those with only a short remaining life were not considered.

The registration marks no particular change in Du Pont policy as, over the years, the company has licensed many of its patents.

Stanolind Cancels Garden City Plant

Hope for a synthetic fuels industry was halved when Stanolind Oil and Gas Co. discontinued the synthetic gasoline and chemicals plant it had undertaken to build near Garden City, Kansas. Large increases in the estimated cost of the project was the reason given for the move. The Brownsville, Texas, project of Carthage Hydrocol, Inc. is still under construction.

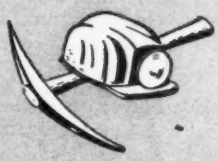
Since the active program was initiated two years ago the estimated capital investment required for the Hugoton pro-

PAINTS AND VARNISHES

Pine oils are used in the paint and varnish making industries as special solvents in alkyd and phenolic resin formulations, as wetting agents and levelers for baked enamels, dispersants for grinding pigments, and as anti-skinning agents. Pine oil is also used as a preservative, wetting agent, and anti-foam agent in casein—and water-emulsion paints.

DISINFECTANTS

High in terpene alcohol content, Hercules Pine Oils are widely used in disinfectants. They are effective, low in cost, safe and easy to use, have a pleasing piney fragrance, long-lasting disinfectant action, do not stain.



MINING

In the mining industry, Hercules Pine Oils are used as frothing reagents in the flotation process. Low in cost, pine oils are effective frothers for the flotation of sulphide minerals—especially where a highly mineralized froth is required. Pine oils are also employed in the flotation of coal, potassium chloride, and talc.

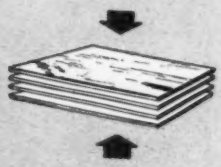
PAPER

Pine oils diverse properties are responsible for their wide acceptance in the paper industry. They are used as anti-frothers, casein preservers, and as wetters and spreaders in coating operations.

HERCULES

PINE OILS

IMPROVE MANY PROCESSES AND PRODUCTS



PLYWOOD ADHESIVES

Pine oils are used as anti-foaming agents, wetting agents, and protein preservatives in plywood adhesives. They perform a similar function in adhesives based on glue, casein, and starch.

YOUR INDUSTRY

Hercules Pine Oils have application in many other industries, such as the textile, soap, cleaners, drug, leather, rubber, and laundry industries. Possibly pine oils have new and desirable applications in your industry? Why not send for literature and testing sample?

HERCULES

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INCORPORATED
992 Market Street, Wilmington 99, Delaware

Please send me information and testing samples of pine oils for evaluation in_____

NAME_____

TITLE_____

COMPANY_____

STREET_____ ZONE_____ STATE_____

CITY_____ NPD-1

ject had more than doubled. Plans are being formulated which may permit reinstatement of a similar program approximately three years from now.

The plant site will be retained but construction and other contracts involving the project will be cancelled, and all financial obligations that Stanolind has incurred will be paid off at this time.

Goodrich Names Miller Production Manager

H. F. Miller, appointed production manager of B. F. Goodrich Chemical Co., with headquarters in Cleveland, Ohio. He has been a plant manager in Akron since 1942.

COMPANIES

COALTAR CHEMICALS CORP., New York, has been appointed American representative for WM. BUTLER & Co. (Bristol) Ltd.

Under this arrangement, Coaltar Chemicals will distribute a wide range of coal tar chemicals of British manufacture. In addition, the corporation will continue to carry on its regular business operations as heretofore.

VIRGINIA-CAROLINA CHEMICAL CORP. has moved its administrative offices to the new home office at 401 East Main Street, Richmond 7, Va. Chemical products produced by V-C include phosphoric acid, phosphates, plant foods, plant insecticides, and industrial cleansers.

JOHN B. CALKIN, coordinator of research for UNION BAG & PAPER CORP., has formed his own consulting business in the pulp and paper, and chemical process industries. Offices will be at 500 Fifth Avenue, New York City 18.

The service will concern problems of development, improvement, market research, forest research, and packaging.

The administrative offices of SHELL CHEMICAL Co., transferred from San Francisco, recently opened in quarters occupying four floors of a new building at 4 West 58th Street, New York.

Approximately 115 administrative and staff employees and their families were involved in the move from the west coast offices. The company's western sales division office will remain in San Francisco.

From the New York office, Shell Chemical will continue to direct the operation of its plants in Houston, Texas, and in Martinez, Dominguez, and Pittsburg, California.

A/S NIRO ATOMIZER, Copenhagen, Denmark, manufacturer of spray drying equipment, has opened a New York office under the name NIRO CORP. at 52 Broadway.

Ben P. Steele, until recently in charge of the Pennsalt Manufacturing Co.'s former New York offices, has organized the BEN P. STEELE Co., New York. Industrial, agricultural chemicals and insecticides for export and domestic use will be featured.

The new products division of the MINNESOTA MINING & MANUFACTURING Co., St. Paul, Minn., has completed a pilot plant for electrochemical production of fluorocarbon compounds. The plant is designed to produce a variety of completely fluorinated organic compounds without utilizing elementary fluorine at any stage of the process. This process is expected to result in the production of fluorocarbons ranging from simple gases to high-boiling liquids and at a cost low enough to permit extensive use of these materials in industry.

The production of sodium penta barbital, U.S.P., has been announced this

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(CRUDE, POWDERED)

GUMS:

GUM ARABIC
GUM ARABIC BLEACHED
GUM GHATTI
GUM KARAYA (Indian)
GUM TRAGACANTH
GUM EGYPTIAN
GUM LOCUST (Carob Flour)
QUINCE SEED

★

CASEIN

SPECIALTIES:

MENTHOL (Crystals)
★
TARTARIC ACID
★
CREAM OF TARTAR
★
EGG ALBUMEN
EGG YOLK
BLOOD ALBUMEN
★
JAPAN WAX
CANDELILLA WAX

REPRESENTATIVES:

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BOSTON, MASS.: P. A. HOUGHTON, INC.
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ST. LOUIS: H. A. BAUMSTARK & CO.
LOS ANGELES: JOHN A. HUGHES

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ALKYLATING AGENTS?

curing accelerators? **germicides?**

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Products Available	*Suggested Uses*
Benzenesulfonchloride★	As an intermediate in the preparation of dyestuffs, pharmaceuticals and resins. For blocking active hydroxyl and amino groups in organic compounds.
Benzenesulfonamide★	As a plasticizer for polyamide resins. As an intermediate in the manufacture of germicides, oxidizing agents, pharmaceuticals and dyestuffs.
N-substituted Benzenesulfonamides:	
N-Ethyl Benzenesulfonamide N,N-Diethyl Benzenesulfonamide N-Isopropyl Benzenesulfonamide N-n-Butyl Benzenesulfonamide N,N-di-n-Butyl Benzenesulfonamide	Plasticizers for cellulose-derived plastics, synthetic rubber and polyamide resins.
Benzenesulfonic Acid Esters:	
Methyl Benzenesulfonate Ethyl Benzenesulfonate n-Propyl Benzenesulfonate	Alkylating agents.
n-Butyl Benzenesulfonate Ethylene Glycol Dibenzenesulfonate Diethylene Glycol Dibenzenesulfonate	As curing accelerators for various synthetic resins. Also as plasticizers and softeners for cellulose-derived plastics.
Chloramine-B Dichloramine-B	Germicidal and deodorizing agents. Oxidizing agents. For controlling fungi in grain and seeds.

★*Available in both technical and refined grades.*

For additional data, write for a free copy of our booklet describing the properties and uses of Wyandotte Synthetic Organic Chemicals.

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Glycols • Ethylene Dichloride • Propylene Dichloride • Chloroethers • Aromatic Suffonic Acid Derivatives • Other Organic and Inorganic Chemicals

Wyandotte
REG. U. S. PAT. OFF.

month by MILLMASTER CHEMICAL CO., New York City, as an addition to its line of pharmaceutical specialties and organic chemicals.

The chemical is being produced at the plant of Millmaster's subsidiary, BERKELEY CHEMICAL CORP., N. J.

PERSONNEL

Company Officers

• William A. McIntyre has been named head of THE SHERWIN-WILLIAMS CO.'s Chicago lacquer laboratory. He has been with The Sherwin-Williams Lacquer Department staff at Chicago since 1932 and prior to then was with Du Pont for three years.

• William P. Marsh, Jr., formerly executive vice-president, has been elected president of U. S. INDUSTRIAL CHEMICALS, INC. He succeeds Glenn L. Haskell who is retiring and becomes vice-chairman of the board of directors.

• C. G. Kirkbride, director of laboratories for HOUDRY PROCESS CORP., has been elected vice-president in charge of research and development. Mr. Kirkbride, a director of the company, has served as laboratories chief since April, 1947.

• Cary R. Wagner has been named vice-president in charge of operations of GENERAL ANILINE & FILM CORP. For the past year he has been vice-president in charge of research and development of General Aniline.

CALENDAR *of* EVENTS

***AMERICAN INSTITUTE OF CHEMICAL ENGINEERS*, annual meeting, Pennsylvania Hotel, New York City, Nov. 7-10.**

***AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS AND INSTITUTE OF RADIO ENGINEERS*, conference on electronic instrumentation, The Engineering Societies Building, New York City, Nov. 29-Dec. 1.**

***AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS*, annual meeting, Fairmont Hotel, San Francisco, Feb. 14-17.**

***AMERICAN MANAGEMENT ASSOCIATION*, production conference, The Drake, Chicago, Nov. 18-19.**

***AMERICAN OIL CHEMISTS' SOCIETY*, annual fall meeting, Hotel Pennsylvania, New York City, Nov. 15-17.**

***AMERICAN PETROLEUM INSTITUTE*, 28th annual meeting, Stevens Hotel, Chicago, Nov. 8-11.**

***AMERICAN PHARMACEUTICAL MANUFACTURERS ASSOCIATION*, Waldorf Astoria, New York City, Dec. 6-8.**

***AMERICAN SOCIETY FOR QUALITY CONTROL*, 3rd midwest quality control conference, Sherman Hotel, Chicago, Nov. 4-5.**

***CHEMICAL MARKET RESEARCH ASSOCIATION*, Toronto, Canada, Dec. 9.**

***NATIONAL ASSOCIATION OF INSECTICIDE AND DISINFECTANT MANUFACTURERS*, New Yorker Hotel, New York City, Dec. 6-7.**

***NATIONAL FERTILIZER ASSOCIATION*, Atlanta-Biltmore Hotel, Atlanta, Nov. 15-17.**

***TEXTILE RESEARCH INSTITUTE*, annual general meeting, Waldorf Astoria, New York City, Nov. 18.**

• FALK & Co. has promoted its technical director, Samuel S. Gutkin, to vice-president and technical director.

• EASTERN COLOR & CHEMICAL CO., of Providence, R. I., has appointed Iver W. Fallstrom as vice-president and technical director in charge of sales and service.

Mr. Fallstrom will direct sales and applications to the textile industry. He has served as director of development and application for Arnold Hoffman & Co., Inc. for the past 10 years.

Research

• SUN CHEMICAL CORP. has appointed Wilber Otis Teeters as director of research to succeed Paul V. McKinney, who resigned from the corporation.

Dr. Teeters joined Sun Chemical in February, 1946, as principal research chemist.

• R. F. Boyer was recently named director of the Physical Research Laboratory of THE DOW CHEMICAL CO., Midland, Michigan, and W. C. Bauman was appointed assistant director.

• Harold A. Beatty has been appointed to the newly-created position of assistant director of research at the ETHYL CORP. Research Laboratories in Detroit.

Dr. Beatty, who has been associated with Ethyl Corporation for the past 17 years, will assist director of research John B. Macauley in the over-all guidance of research and technical service activities.

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Quinoline
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Koppers Tar Bases are soluble in many organic solvents, including alcohols, ethers, esters, hydrocarbons, and ketones. The lower-boiling bases are completely miscible with water in all proportions. The water-solubility of the bases decreases with increases in molecular weight.

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CHEMICAL SPECIALTIES

A department devoted to news of the chemical specialties field. Descriptions of new specialty products will be found in the New Products & Processes department.

"One Shot" Treatment Controls Cattle Lice

Results of the tests conducted by U. S. Industrial Chemicals, Inc. show that a single treatment of cattle in the Great Plains and Rocky Mountain areas with its recently developed insecticides brought seasonal louse control, spectacular improvement in condition and weight gains running over 70 pounds per animal. The new-type insecticides, known as Pyrenones, combine pyrethrins with the synergist piperonyl butoxide. They can be used as dips, sprays or dusts, with equally satisfactory results. Furthermore, the studies revealed that the insecticides are practically without hazards to animals and operators, and offer no danger of contamination of meat or meat products.

The economic importance of controlling louse infestations on range and feeder lot cattle as an established livestock management practice is obvious. A single treatment program saves time and labor, and avoids the weight losses incurred in the collection of the animals for treatment and their return to the range. The economic gains to stockmen would be great at any time but would be especially so at the present time. Compilation of the data gathered in the various tests enabled U. S. Industrial Chemicals to develop effective combinations of the insecticides which are being made available, through manufacturers of finished insecticides, in the cattle country. The most widely acceptable formula, the company said, probably will be an emulsifiable concentrate containing 10 grams piperonyl butoxide and 0.5 grams pyrethrins per 100 cc., equivalent to approximately 11 per cent piperonyl butoxide and 0.55 per cent pyrethrins. This concentrate will be recommended for use at a dilution of 1 to 100 parts of water, or one gallon to 100 gallons of water. Specially prepared dusts will also be available.

New York Testing Economic Poisons

All kinds of economic poisons are now being tested at the New York State Experiment Station to check manufacturers specifications on their labels. According to the State's new law, these materials must be labeled with the active ingredients, the inert ingredients, the names, and the percentages. Not only insecticides and fungicides are included in this law, but weed killers, rodent poisons, and any other substance which could be classed as an economic poison.

Over 7,000 different brands of these materials appear on the market in New York State each year. In 1947, when only insecticides and fungicides were tested, 26 different active ingredients were checked, involving about 900 determinations. Station scientists report that relatively few economic poisons show evidence of intent to defraud, but that materials are bound to appear on the market which are not according to the manufacturer's guarantee.

Detergents De-Oil Linoleum, Furniture

Although "soapless suds" and synthetic detergent powders aid dish washing, they are not so good to use on the kitchen linoleum. In dish washing they are excellent for the very reason they are harmful to linoleum—they remove oil and grease. The latter, however, needs the oil it contains to stay soft and pliable. Likewise furniture needs the oil in its natural finish or in its coat of paint.

Thus any oil-absorbing cleaner is not good for either the floor or the furniture. Even soap has a similar drying effect and should be carefully rinsed off with clear water. Linoleum and furniture stay in best condition with frequent waxing and oiling.

Dry Weather Lessened 2,4-D Effectiveness

The weed killer 2,4-D is receiving undeserved blame for poor results obtained by some Iowa farmers with in-crop and pre-emergence spraying this year, according to E. P. Sylwester, extension botanist at Iowa State College. Both dry weather and unfavorable soil conditions had a lot to do with unsatisfactory kills.

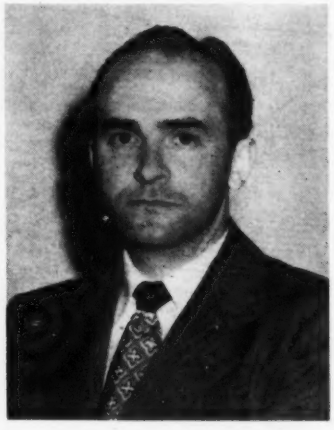
The long dry spell in the state during May and early June made unfavorable conditions for farmers to get best results from using 2,4-D in crops and as a pre-emergence spray. This was particularly true with pre-emergence spraying.

Moisture in the soil before and after applying 2,4-D is important. If the soil is too dry to promote new growth of weeds, the treatment doesn't work so well. The weeds must be in active growing condition to absorb the chemical. Also, if the air is too dry, 2,4-D may not penetrate the vegetation effectively.

Much failure of 2,4-D pre-emergence spraying was due to lack of moisture in the surface soil to absorb the chemical and carry it down where it would do its job of killing.

There is a good reason why 2,4-D hadn't killed roadside weeds in some cases. Dry weather meant dusty roads and dust on weeds makes spraying less effective. The dust acts as an insulator and the 2,4-D doesn't contact the plant. Later the dust blows off or is washed off carrying the chemical with it and weeds are not injured much.

Gain Promoted by Winthrop-Stearns



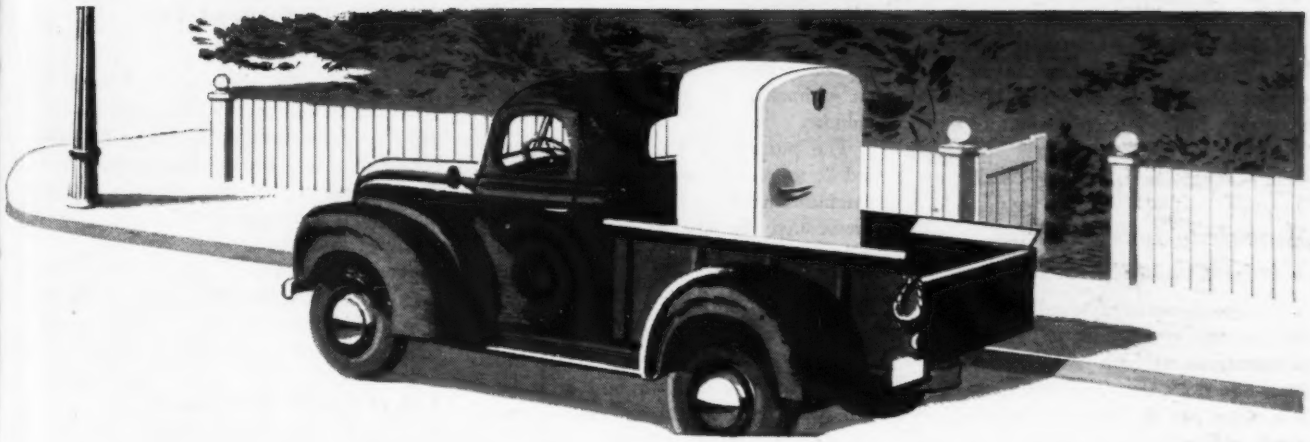
John F. Gain, Jr., named head of the bacteriological control department of Winthrop-Stearns Inc. He formerly was assistant to Carl Lawrence who resigned to accept a professorship at the University of Michigan.

Simple Device Applies Ground Sprays

Increased use of chemicals in weed control has emphasized the need for versatile spray equipment. The greater use of 2,4-D as a selective herbicide on lawns, golf courses, parkways, pastures, corn fields and the like shows the need for a sprayer of low cost that can apply concentrated solutions at rates of 5 to 10 gallons per acre instead of the conventional 150 to 200 gallons.

To meet these new demands, especially for the small operator, Michigan State College Horticulturists have constructed an inexpensive, easily-operated sprayer from a common 3-gallon hand sprayer mounted on a hand garden cultivator and equipped with a spray boom. They report that such a sprayer can easily be adapted to a specific crop such as corn and gladioli where 2,4-D is to be applied between the rows and away from the crop.

In addition to its use for applying 2,4-D, the simple sprayer can readily be used for applications of other materials in concentrated form such as insecticides, fungi-



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Liverpool, England • Paris, France • Sydney, Australia • Zurich, Switzerland • Milan, Italy • Buenos Aires, Argentina

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cides, and hormones. It should also prove definitely superior to the conventional hand sprayer in the application of dilute sprays. Plans and descriptions of the device may be had upon request from the Department of Horticulture, Michigan State College, East Lansing, Michigan.

American Latex Offers Heat-Resistant Coatings

Two new and improved thermal barrier materials capable of withstanding temperatures as high as 2800° F. have been added by the American Latex Products Corp. to its line of "Stabond" cements, adhesives and allied compounds. Known as Stabond FR 8 and FR 10, they are obtainable in various consistencies for application by trowel, brush or extrusion gun and are of use where a problem of heat resistance or exchange exists.

In a test conducted by a leading aircraft manufacturer, an oil tank covered by a ⅛-inch coating of FR 10 withstood a 2,000° F. flame blast for 36 minutes without damage to the underlying metal. The metal of an unprotected tank was burned through by the same flame in one-half minute.

The new compounds, plastics that cure by solvent release, are particularly suitable for application as an insulating material to electrical junction boxes, heat exchanger couplings and similar points. They will prove valuable for lagging steam pipes and hot air ducts wherever resistance to vibration as well as heat is a desired characteristic. They may also be used as an abrasion resistant coating for electrical systems.

National Foam Acquires "Drench"

National Foam System, Inc., Philadelphia, foam fire fighting manufacturers, has purchased from Arnold, Hoffman & Co., Inc., Providence, R. I., its goodwill, patents, formulae and trademark covering the wetting agent known as Drench.

Drench, which penetrates much deeper than water and one percent of which doubles the effectiveness of ordinary water in extinguishing fires, will be immediately manufactured at National Foam System's principal plant at West Chester, Pa.

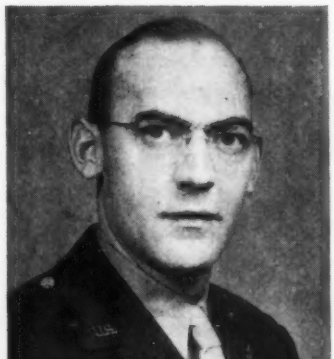
Wood Preservative Standard Set

The National Bureau of Standards has secured acceptance of Copper Naphthenate Wood-Preservative (spray, brush, dip application) Commercial Standard CS152-48 by the trade. On June 9, a recommended commercial standard proposed by manufacturers and approved by other interests, was circulated by the National Bureau of Standards to producers, distributors, testing laboratories, and users for written acceptance. Since that time acceptances have been received representing an estimated 90 percent of production volume.

The purpose of the commercial standard is to provide a nationally recognized specification for copper naphthenate wood-preservative for the guidance of buyers, sellers and testing laboratories; to promote fair competition and consumer confidence in products conforming to the standard; and to provide a basis for labeling and guaranteeing the quality of the product. The standard covers physical and chemical characteristics and methods of test of copper naphthenate products supplied in either concentrated or ready-for-use form.

Printed copies of the new standard will be available as soon as practicable. Until that time, mimeographed copies can be obtained from the Commodity Standards Division, National Bureau of Standards, Washington 25, D. C.

Amalgamated Names Robinette



Hillary Robinette, Jr., named research director of Amalgamated Chemical Corp., Philadelphia. He has been in the new products division since his release from military service.

Sharp & Dohme Markets New Form of Penicillin

Sharp & Dohme, Inc., is marketing nationally "Pazillin," a new dosage form of penicillin that doubles the duration of action for a single injection of penicillin that was previously attainable with plain procaine penicillin in oil. The size of the injection dosage of the new material is 300,000 units, same as other types of parenteral penicillin.

Addition of aluminum stearate, a water repellant compound, is responsible for Pazillin's prolonged therapeutic effectiveness. By jelling the oil in which the penicillin is suspended, this compound slows the rate at which the penicillin enters the blood stream from the muscle.

Cowles Detergent Co. Changes Name

Stockholders of the Cowles Detergent Co. recently approved a resolution changing the firm's name to Cowles Chemical Co. The reason for the change was that the business of the company is becoming increasingly diversified and is no longer restricted to detergents.

Founded in 1885, the company has long been active in the manufacture of industrial chemicals and detergent silicates as well as specialized detergents.

Ethyl Corp. Producing Benzene Hexachloride

Benzene hexachloride, a key ingredient of dusts to combat cotton insects, is now being produced at the Ethyl Corp. plant in Baton Rouge, Louisiana, for sale to insecticide manufacturers.

Full-scale or experimental use of benzene hexachloride is reported not only against such cotton pests as the boll weevil, aphid, leafworm and thrip, but also against insects of poultry and livestock, and against grasshoppers. Poisoning of locusts in South America and Africa with benzene hexachloride mixtures has been reported frequently.

In the cotton states, benzene hexachloride is finding a growing market where it is being used for the cotton crop in the popular 3-5-40 mixture (3% gamma benzene hexachloride, 5% DDT, and 40% sulphur).

Hand Spray Produces Effective Aerosol

Paul Engstrum Associates, Washington, D. C., is offering a Schroeder-type hand-operated aerosol insecticide spraying device called "Air-O-Spra." Interest in this new spray has grown to the point where the producers are casting about for a national distributor. This is a commercial adaptation of a device initially developed and patented by H. O. Schroeder, in connection with work carried on by the U. S. Department of Agriculture. Schroeder and A. W. Lindquist, both of the Bureau of Entomology and Plant Quarantine, have determined that insecticidal sprays delivered in an "atomized form" such as the device produces, require 1/20 the quantity of insecticide for effectively killing flies, mosquitoes and other insects that conventional household spraying require.

The new device is cylindrical in shape, about ten inches long and one and three-quarter inches in diameter, with a slide section that produces a pumping action very similar in operation to that of a bicycle tire hand pump. It is easily refillable, and the reservoir has a capacity of three fluid ounces, sufficient for effectively treating approximately three hundred fifty thousand cubic feet of space.

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Recent indications that flies are carriers of poliomyelitis has spurred interest in these sprays. Horace Heidt is starting a polio research institute at San Diego for which 200 Air-O-Spra's have been ordered.

AIF Discusses Pesticide Controls

Overlapping of federal and state control laws, and the duplication of state inspection fees on agricultural pesticide chemicals came up for discussion by industry and government spokesmen at the 15th annual meeting of the Agricultural Insecticide and Fungicide Association, held at Spring Lake, N. J., last month.

Pointing out that all pesticides in interstate commerce are regulated by a comprehensive federal law, Charles L. Smith, technical advisor of the A.I.F.A., said that "Unless a need and a real benefit to the farmer is going to result from duplication of analyses on the same product by each state, it seems reasonable to us that state control be limited to products made and sold within that state." He added that the insecticide and fungicide industry is "unique in the agricultural chemical field, since by far the major portion of its products cross state lines."

Dr. Smith contrasted present state insecticide laws and their inspection fees with the various food and drug regulations under which no fees are required. He pointed out that insecticide manufacturers are required to pay inspection tariffs in numerous states on the same product. But, he said, consumers in states that have no such fees are adequately protected on products shipped into their state.

New Copy Developer Cuts Processing Time

Philip A. Hunt Co., of Brooklyn, N. Y., manufacturers and distributors of chemicals for lithographers, photo-engravers and photographers, has introduced its new formula Graph-O-Stat Developer for photo copy work. It is said to afford faster development, and give finer quality reproductions with all standard types of paper used in copying machines.

Hercules Establishes Toxaphene Service

Booming sales of Toxaphene, chlorinated camphene, the cotton insect poison recommended by nine leading cotton-growing states, has prompted Hercules Powder Co. to establish a new technical service branch office in Dallas, Texas. It will be in the charge of P. J. Reno, who for the past three years has been working with various southwestern state and federal agricultural agencies, cotton growers, and manufacturers of Toxaphene dusts and sprays.

Establishment of the new office will facilitate Hercules' work with the various southwestern agricultural agencies and cotton growers on the use of Toxaphene dusts and sprays.

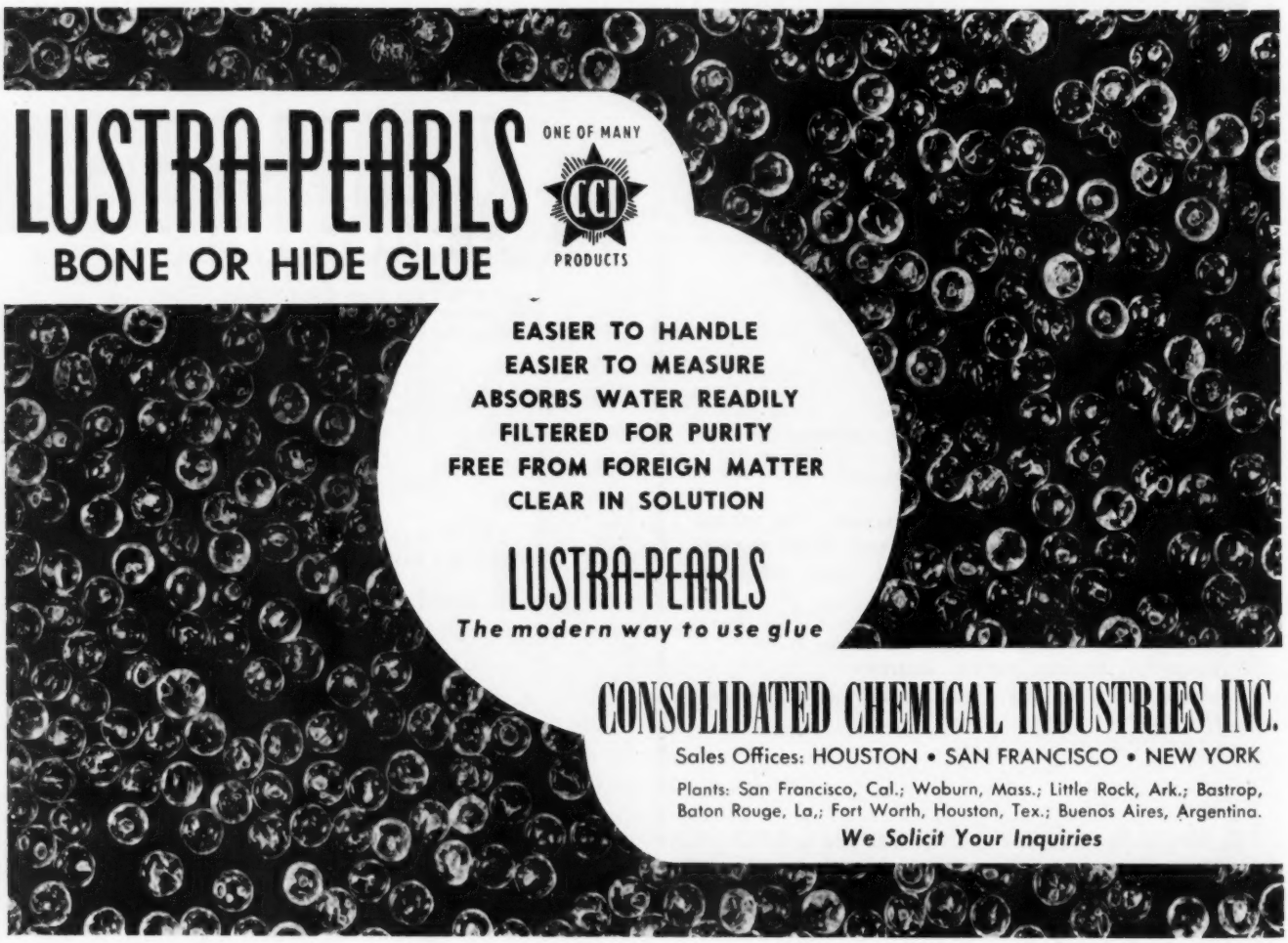
Proposed Formula for Non-Mildew Dressing

The U. S. Bureau of Standards has proposed a federal specification for a dressing intended to prevent the growth of mildew on leather. Paranitrophenol is the proposed type I fungicide; the active ingredient in type II is optional.

Following are the major components in the type I specification:

	Percent	
	Min.	Max.
Paranitrophenol	1.9	2.1
Animal oil	9.8	10.2
Hydrocarbon oil	9.8	10.2
Perchloroethylene	66.0	70.0
Cyclohexanone	9.8	10.2

Because of the recognized toxicity of paranitrophenol, the bureau advises that the formulation should be carefully controlled. The dressing is not intended for application to leather articles where long, intimate contact is made with the skin in connection with their use.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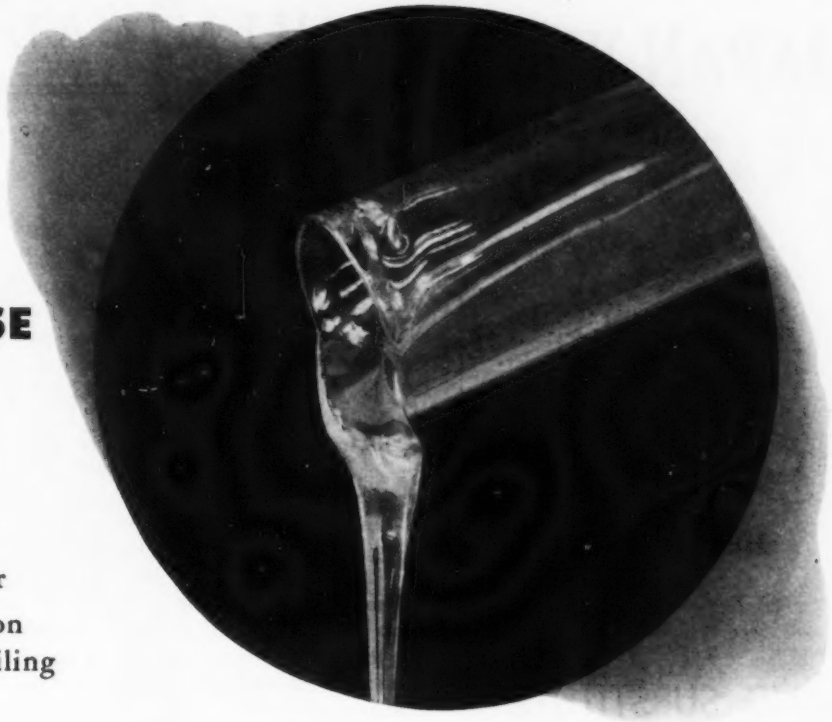

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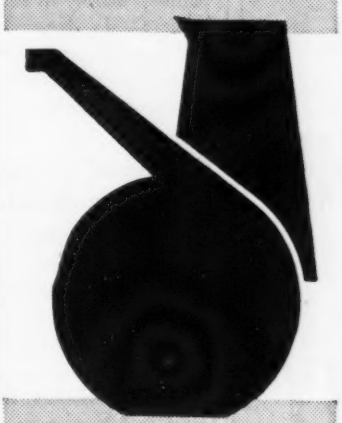

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CHEMICAL MARKETS

Record Dye Production Approaching Ceiling

The manufacture of an estimated 220 million pounds of dyes in the United States during 1948 is the largest volume ever produced by any country. Under the early protection of tariff and stimulated by the favorable patent acquisitions as a result of World War I, followed by a plentiful supply of raw materials, this industrial giant has grown from a production of 6.6 million pounds in 1914 to the above stature. The establishment of the United States as the leading producer of dyes has many indirect implications. This industry has always been fostered by the major governments as fundamental to organic chemical progress. Therefore the U. S. Department of Commerce points out that although production may increase another 10-15 per cent if the demand continues, it is approaching a ceiling.

The United States is now the leading exporter of dyes and at a rate which is a record for any country. This is reminiscent of 1920 (also two years after war ended) when Germany was out and the U. S. exports soared to 30 million pounds (now at 65 million) only to decline to an abnormal low the following year when German industry came into production. This time the export market has been vacated by both Germany and Japan. However, two factors prevent this situation from being all roses for the exporter. First, the dollar credit shortage looms as a curtailment of exports and already has reduced them 14 million (20 per cent) pounds—mainly in sulfur black indigo and other C. T. dyes. The second factor is the ever-present possibility of German dye production restoration, largely a matter of international policy.

Chemical Exports Continue Decline

Industrial chemicals registered a sizeable decline in exports in June as did all domestic merchandise with the exception of crude foodstuffs. During that month, the value of chemical exports was 10.8 millions of dollars as contrasted with 11.8 millions of dollars in May 1948. The falling off is even more sharp when compared with June 1947 when the value of exports was 13.2 millions of dollars, and the monthly average of 13.4 for the year 1947. Although the trend over the past year shows a decrease in chemical exports, the gain over 1939 when the dollar value of the monthly average was only 3.0 million is considerable. Some of this increase, however, can be accounted for by higher prices.

First Zinc from Alaska Ores

An outstanding feature of the Alaska mineral production record for 1947 was the recovery of zinc, for the first time, from Alaska ores, according to the San Francisco Office of the Bureau of Mines. Production of gold in Alaska in 1947, almost entirely from placer operations, increased 23 percent above the output for 1946. The output of silver advanced 58 percent, and lead gained 130 percent. Copper production—entirely as a by-product from lead ore—remained relatively small, although the total recovered was six times that in 1946.

The Alaska production in 1947 (in terms of recoverable metal) was 279,988 fine ounces of gold, 66,150 fine ounces of silver, 12 short tons of copper, 264 tons of lead, and 25 tons of zinc. Production in 1946 was 226,781 ounces of gold, 41,793 ounces of silver, 2 tons of copper, and 115 tons of lead. Available records indicate that the zinc production of 50,000 pounds, all from one mine, was the first to be produced from Alaskan ores.

Barite at Record Level in 1947

The United States continued to lead the world in barite production and established a record in 1947 of 884,219 short tons, reports of producers to the Bureau of Mines reveal. Primary barite sold or used by producers totaled 834,082 short tons valued at $6,171,342. The average value of primary barite sold or used increased 16 cents per ton to $7.40. Imports of crude barite were up to 53,222 short tons, a 19 percent increase. Barite sold or used plus imports (our apparent new supply) was 887,304 short tons, 94 percent of which was from domestic sources.

The chief use of barite in 1947 was in oil-well drilling; lithopone was second, chemicals third, fillers fourth, and glass fifth. The distribution of consumption of barite in the United States in 1947 was reported as follows (1946 in parentheses): For well drilling, 467,350 short tons (372,610); for lithopone, 167,321 (154,166); for chemicals, 107,267 (102,439); for glass, 33,641 (29,181); for paint filler, 29,000 (26,000); for rubber filler, 17,000 (20,000); and for other purposes,

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including grinding losses, 14,239 (17,677); total, 835,818 (722,073). These figures include both foreign and domestic barite.

Inorganic Production Dips Slightly

United States production levels of inorganic chemicals for June, although slightly lower than for the preceding month of May 1948, were about the same as for June 1947, according to the Bureau of the Census. Decreases from May 1948 quantities were reported for 23 of the 35 chemicals included in the Bureau's current monthly survey, while increases were reported for only 12. In comparison with June 1947, 18 chemicals were produced in smaller and 17 in greater quantities.

The June production of chlorine, electrolytic sodium hydroxide and molybdate chrome orange reached record highs. The monthly totals for chlorine and electrolytic sodium hydroxide exceeded the previous highs of 132,668 and 130,292 short tons respectively attained during March 1948 by 563 and 204 short tons, and the production of molybdate chrome orange surpassed the record high of 577,000 pounds reported for the previous month by 13,000 pounds. In addition to these three products, production gains over May occurred only for calcium arsenate, activated carbon, carbon dioxide, chrome yellow and orange, hydrofluoric acid, di- and tribasic sodium phosphates, sodium silicate, and zinc yellow.

Market Review

A dull market characterized the heavy chemicals trading throughout the month. For many items the gap between resale prices and the selling prices of producers had become so small that dealers showed no interest in them. Consumption of solid caustic kept pace with production, while the liquid material was in fairly good supply. Domestic lots of caustic offered for resale at 6¢ per pound continued to go unnoticed as arrivals of imported lots (not subjected to license for export) moved at 8¢ per pound. Copper salts enjoyed normal industrial consumption, but were in little demand for agricultural purposes with the end of the season at hand. The first advance in synthetic acetic acid in a year was registered when a major producer increased glacial acetic 50¢ per 100 pounds in tankcars. The new price is $9.12 per cwt., spot, and $8.62 per cwt., f.o.b., works, on contracts.

The condition of most basic coal tar chemicals was unchanged—in short supply. However creosote was available, although cresylic was tight. Some foreign lots were expected to ease this situation. Paradichlorobenzene prices were reduced 1½¢ per pound, but it was feared that an increase was due for some aromatics in the face of the increased cost of benzene, and the firmness of the market for that basic material. The arrival of over a hundred casks of Belgian phthalic anhydride, plus the opening of Reichhold's new plant for that scarce item aroused considerable interest.

Domestic demand for agricultural chemicals was slow as farmers waited to learn future prices before ordering mixed fertilizers. Foreign orders began to be placed for the 144,000 short tons of ammonium sulfate allotted by the International Emergency Food Council for 1948-49.

Dyestuffs continued to feel the slowness of the textile industry as demand for a number of items fell off. Some beneficial effect should be felt soon from the entry of the U. S. Army into the dyestuffs market to buy 4 million pounds of dyestuffs over the next 6-9 months to help the Japanese textile industry.

Among fine chemicals, there were several price changes. A major producer increased potassium iodide and potassium iodide resublimed 15¢ and 20¢, respectively, to $2.10-2.20 per pound and $2.55-2.66 per pound according to quantity. Oxalates followed oxalic acid up: ammonium oxalate to 25¢ and potassium oxalate to 30¢ per pound, both up 2¢. On the downward side were reductions in tartaric acid and cream of tartar of 4¢ and 3¢ per pound, respectively. New prices: tartaric acid, 37½¢ in 10,000 lots; cream of tartar, 32½¢ in 5,000 lots, 33½¢ for less. Major producers also reduced ethyl alcohol 5¢ to 10¢ per gallon depending on the formula.

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Important Announcement

to users of

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PARAGON Testing Laboratories, Orange, New Jersey, producers and refiners of fine organic chemicals, has been acquired by The Matheson Company, Inc., of East Rutherford, New Jersey, and Joliet, Illinois. The business is being continued as the Paragon Division of The Matheson Company.

The high standards of quality set for Paragon Fine Organic Chemicals will be rigidly maintained. Furthermore, a change in the method of packing, using two standard sizes for all chemicals, now enables us to speed delivery.

A new price list on our present line of 1500 fine chemicals has just been published. If you have not received your copy, write for it today.

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CURRENT PRICES

Chemical prices quoted are of American manufacturers for spot New York, immediate shipment, unless otherwise specified. Products sold f.o.b. works are specified as such. Important chemicals are so designated.

Oils are quoted spot New York, ex-dock. Quotations f.o.b. mills, or for spot goods at the Pacific Coast are so designated.

Raw materials are quoted New York f.o.b., or ex-dock. Materials sold f.o.b. works or delivered are so designated.

The current range is not "bid and asked," but are prices from different sellers, based on varying grades or quantities or both.

Purchasing Power of the Dollar: 1926 Average—$1.00
September, 1946, $0.759 September, 1947, $0.61
September, 1948, $0.571

	Current		1948		1947	
	Low	High	Low	High	Low	High
Acetaldehyde, 99%, drs wks.....lb.	.11	.12	.11	.12	.11	.15
Acetic Anhydride, drs, c.l., frt. all. E.....lb.	.13	.14½	.13	.14½	.11½	.14½
Acetone, tks, delv.....lb.	.07	.09	.07	.09	.07	.09
ACIDS						
Acetic, 28% bbls.....100 lbs.	3.78	4.08	3.78	4.08	3.38	4.08
Glacial, synthetic C. P., drs, wks.....100 lbs.	13.50	14.00	13.50	14.00	13.50	14.00
Acetylsalicylic, Standard USP.....lb.	.45	.59	.45	.59	.45	.59
Benzoic, tech, bbls.....lb.	.43	.47	.43	.47	.43	.47
USP, bbls, 4,000 lbs. up..lb.	....	.54	....	.54	....	.54
Boric tech, bbls. c-l, frt. split.....tons	....	124.00	....	124.00	....	124.00½
Chlorosulfonic, drs, wks....lb.	.03	.04½	.03	.04½	.03	.04
Citric, USP, crys, gran, bbls.....lb. *b*	.22	27½	.22	.27½	.20	.23
Cresylic 50%, 210-215° low boil 50%, drs, wks, frt, equal.....gal.	1.26	1.61	1.26	1.61	1.01	1.26½
Formic, 85%-90% cbys.....lb.	.12	.14½	.12	.14½	.10	.14
Hydrofluoric, 30% steel, drs.....lbs.	.08	.09	.08	.09	.08	.09
Lactic, 22%, bbls, c.l., wks.....100 lbs.	....	5.80	....	5.80	....	4.40
44%, light, bbls, wks..100 lbs.	8.15	10.95	8.15	10.95	7.80	8.55
Maleic, Anhydride, drs.....lb.	.25	.31	.25	.31	.25	.26
Muriatic 18° cbys.....100 lbs.	1.50	2.90	1.50	2.90	1.50	2.90
20° cbys, c-l, wks....100 lbs.	1.85	2.00	1.85	2.00	1.85	2.00
22° cbys, c-l, wks....100 lbs.	2.35	2.50	2.35	2.50	2.35	2.50
Nitric, 36°, cbys, wks .100 lbs. *c*	5.00	6.30	5.00	6.30	5.00	6.30
38°, c-l, cbys, wks..100 lbs. *c*	2.35	5.50	2.35	5.50	....	5.50
40°, c-l, cbys, wks..100 lbs. *c*	6.00	6.50	6.00	6.50	....	6.50
42°, c-l, cbys, wks..100 lbs. *c*	6.50	7.00	6.50	7.00	....	7.00
Oxalic, bbls, wks.....lb.	.13	.14½	.13	.14½	.11¾	.14
Phosphoric, 100 lb. cbys, USP.....lb.	.10½	.13	.10½	.13	.10½	.13
Salicylic tech, bbls.....lb.	.31	.38	.31	.38	.26	.42
Sulfuric, 60°, tks, wks.....ton	12.25	13.50	12.25	13.50	....	13.50
66°, tks, wks.....ton	15.00	17.50	15.00	17.50	....	17.50
Fuming 20%, tks, wks...ton	18.00	20.50	18.00	20.50	....	20.50
Tartaric, USP, bbls.....lb.	.37½	.50	.37½	.50	.49½	.55
Alcohol, Amyl (from Pentane) tks, delv.....lb.	.17	.25	.17	.25	....	.25
Butyl, normal, syn, tks...lb.	....	.17½	....	.17½	....	.17
Denatured, CD, proprietary solvent.....gal. *d*	.87½	1.08½	.87½	1.08½	1.00½	1.03
Isobutyl, ref'd, drs.....lb.	....	.13	....	.13	....	.13
Isopropyl ref'd, 91% dms.....gal.	.44	.50½	.44	.50½	.41	50½
Alum, ammonia, lump, bbls, wks.....100 lbs.	4.05	4.25	4.05	4.25	....	4.25
Aluminum, 98.99%....100 lbs.	15.00	16.00	15.00	16.00	15.00	16.00
Chloride anhyd, l.c.l. wks..lb.	....	.12½	....	.12½	....	.10¼
Hydrate, light, bgs.....lb.	....	.17	....	.17	....	.17
Sulfate, com'l. bgs, wks, c-l.....100 lbs.	1.15	1.30	1.15	1.30	1.15	1.30
Sulfate, iron-free, bgs, wks .....100 lbs.	1.95	2.50	1.95	2.50	1.75	2.50
Ammonia anhyd. cyl.....lb.	.16	....	.16	....	.14½	.20
Ammonia, anhyd, frt, tank cars, wks, frt, equalized..ton	59.00	70.00	59.00	70.00	....	59.00
Ammonium Carbonate, USP lumps, drs.....lb.	.08¼	.19	.08¼	.19	.08¼	.19
Chloride, USP, bbls, drms, kgs.....lb.	.13	.15	.13	.15	.13	15
Nitrate, tech, bgs, wks...lb.	.0213	.0225	.0213	.0225	.0218	.0225
Oxalate pure, grn, bbls...lb.	.23	.29	.23	.29	.23	.29
Perchlorate, kgs.....lb.	.25	....	.25	....	.24	.25
Phosphate, dibasic tech, bgs.....lb.	.07	.07¾	.07	.07¾	.07	.07¾
Stearate, anhyd, drs.....lb.	....	.34	....	.34	....	.34
Sulfate, drs, bulk.....ton	30.00	45.00	30.00	45.00	30.00	38.00

USP $25 higher; Prices are f.o.b. N. Y., Chicago, St. Louis, deliveries ½c higher than NYC prices, *a* Powdered boric acid $5 ton higher; *b* Powdered citric acid is ½c higher; *c* Yellow grades 25c per 100 lbs. less in each case; *d* Prices given are Eastern schedule.

	Current Low	Current High	1948 Low	1948 High	1947 Low	1947 High
Amyl Acetate (from pentane) tks, delv....lb.	.21	.29	.21	.29	.21	.24
Aniline, Oil, dms....lb.	.13	.15	.13	.15	.12	.14
Anthraquinone, 99.5%, bbls.lb.	.70	.80	.70	.80	....	.70
Antimony Oxide, bgs....lb.	.26	.32	.26	.32	.21	.31
Arsenic, whl, bbls, powd....lb.	.06	.08	.06	.08	.05	.08
Barium Carbonate precip, wks, bgs....ton	67.50	82.00	67.50	82.00	60.00	82.00
Chloride, tech, cryst, bgs, zone 1....ton	85.00	95.00	85.00	95.00	73.00	95.00
Barytes, floated, paper bgs.ton	....	33.30	....	33.30	....	41.95
Bauxite, bulk mines....ton	8.50	10.00	8.50	10.00	7.00	10.00
Benzaldehyde, tech, cbys, drs....lb.	.45	.55	.45	.55	.45	.55
Benzene (Benzol), 90%, tks, frt all'd....gal.	.19	.21	.19	.21	19	.21
Benzyl Chloride, cbys....lb.	.19	.28	.19	.28	.20	.28
Beta-Naphthol, tech, bbls, wks....lb.	.23	.30	.23	.30	.21	.29
Bismuth metal, ton lots....lb.	....	2.00	....	2.00	....	2.00
Blanc Fixe, 66⅔ Pulp, bbls, wks....ton	55.00	65.00	55.00	65.00	40.00	60.00
Bleaching Powder, wks....100 lbs.	2.75	4.75	2.75	4.75	2.50	3.75
Borax, tech, c-l, bgs....ton	48.50	76.00	48.50	76.00	45.00	56.00
Bordeaux Mixture, bgs....lb.	.15	.23	.15	.23	.11	.23
Bromine, cases....lb.	.21	.23	.21	.23	.21	.23
Butyl, acetate, norm, dms..lb.	.30½	.36½	.30½	.36½	.26	.33½
Cadmium Metal....lb.	1.75	2.00	1.75	2.00	....	1.80
Calcium, Acetate, bgs..100 lbs.	3.00	4.00	3.00	4.00	3.00	4.00
Carbide, drs....ton	50.00	140.00	50.00	140.00	50.00	90.00
Chloride, flake, bgs, c-l...ton	21.50	38.00	21.50	38.00	18.50	38.00
Solid, 73-75% drs, c-l..ton	20.00	37.50	20.00	37.50	18.00	37.50
Gluconate, USP, bbls....lb.	.58	.65	.58	.65	.57	.65
Phosphate tri, bbls, c-l...lb.	6.50	6.80	6.50	6.80	6.50	6.80
Camphor, USP, grs, powd, bbls, 2,000-lb. lots....lb.	.66	.78	.66	78	.75	.82
Carbon Bisulfide, 55-gal. drs....lb.	.05	.05¾	.05	.05¾	.05	.05¾
Dioxide, cyl....lb.	.06	.08	.06	08	.06	.08
Tetrachloride, Zone 1, 52½ gal. drs....lb.	.06½	.11	.06½	.11	.0	.07
Casein, Acid Precip, bgs, 10,000 lbs. or more....lb.	.30	.35	.30	.35	.26	.35
Chlorine, cyls, lcl, wks, contract....lb.	.07	.15½	.07	.15½	. ¾	.10½
Liq, tk, wks, contract....100 lbs.	....	2.40	....	2.40	....	2.30
Chloroform, tech, drs....lb.	.20	.23	.20	.23	.20	.23
Coal tar, wks, crude, dms, c-l, wks....dm.	....	10.60	....	10.60	....	10.60
Cobalt, Acetate, bbl....lb.	....	.83¾	....	.83¾	....	.83¾
Oxide, black kgs....lb.	1.275	1.80	1.275	1.80	....	1.30
Copper, metal....100 lbs.	21.50	23.50	21.50	23.50	21.50	24.00
Carbonate, 52-54%, bbls..lb.	.24	.26¼	.24	.26¼	.19½	.26½
Sulfate, bgs, wks cryst. ....100 lbs.	7.60	8.10	7.60	8.10	7.10	8.60
Copperas, bulk, c-l, wks....ton	....	14.00	....	14.00	....	14.00
Cresol, USP, drs....lb.	.14	.19¼	.14	.19¼	.13¾	.15¾
Dibutylamine, c-l, drs, wks..lb.	.52½	.76	.52½	.76	....	.76
Dibutylphthlate, drs....lb.	.32	.38½	.32	.38½	.29	.38½
Diethylaniline, drs....lb.	....	.69	....	.69	....	.48
Diethylene glycol, drs, wks..lb.	.14	.16½	.14	.16½	.14	.15
Dimethylaniline, drs, cl., lcl....lb.	.21	.26¾	.21	.26¾	.20	.24¼
Dimethylphthalate, drs....lb.	.23½	.27½	.23½	.27½	.20	.24¾
Dinitrobenzene, bbls....lb.	.16	.21¾	.16	.21¾	....	.16
Dinitrochlorobenzene, dms..lb.	.14	.17	.14	.17	.14	.15½
Dinitrophenol, bbls....lb.	....	.26¾	....	.26¾	....	.22
Dinitrotoluene, refd., drs...lb.	....	.18	....	.18	....	.18
Diphenyl, bbls, lcl, wks....lb.	.15	.20	.15	.20	.15	.20
Diphenylamine, bbls....lb.	....	.25	....	.25	....	.25
Diphenylguanidine, drs ....lb.	.35	.40	.35	.40	.35	.37
Ethyl Acetate syn. 85-90%, tks, frt. all'd....lb	.09½	.16	.09½	.16	.09½	.12
Chloride, USP, bbls....lb	.20	.22	.20	.22	.18	.22
Ethylene Dichloride, lcl, wks, E. Rockies, drs....lb	.08½	.09½	.08½	.09½	.08½	.09½
Glycol, dms, cl....lb.	....	.15	....	.15	....	.12
Fluorspar, No. 1, grd. 95-98% bulk, c-l mines....ton	....	45.50	....	45.50	....	37.00
Formaldehyde, bbls, cl & lcl....lb.	.0645	.0745	.0645	.0745	.0520	.0745
Furfural tech, tks....lb.	.09½	.13	.09½	.13	....	.13
Fusel Oil, ref'd, drs, dlvd...lb.	.26½	.29½	.26½	.29½	.18½	.29½
Glauber's Salt, Cryst, bgs, wks....100 lbs.	1.25	1.75	1.25	1.75	1.05	1.75
Glycerine dynamite, drs, c-l..lb.	.39½	.40¼	.39½	.40¼	.29½	.75¾
Crude Saponification, 88% to refiners tks....lb.	.23	.32	.23	.32	.23	.60
GUMS						
Gum Arabic, amber sorts bgs....lb.	.14	.15	.14	.15	.13¾	.15
Benzoin, Sumatra, cs....lb.	.40	.45	.40	.45	.50	1.00
Copal, Congo No. 1, bgs....lb.	.25	.29	.25	.29	.26	.29
Copal, East India, chips....lb.	no prices		no prices		no prices	
Macassar DBB, bgs....lb.	.20	.25	.20	.25	.24	.25
Copal Manila....lb.	no prices		no prices		.25	....
Karaya, bbls, bxs, drs....lb.	.20	.51	.20	.51	.20	.55

ABBREVIATIONS—Anhydrous, Anhyd; bags, bgs; barrels, bbls; carboys, cbys; carlots, c-l; less than carlots, lcl; drums, drs; kegs, kgs; powdered, pwd; refined, ref'd; tanks, tks; works, f.o.b., wks.

AHCO

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ALSO FOR LUBRICANTS AND ALLIED PRODUCTS

DISTILLED GRADES

Superior BECAUSE OF

LOW VOLATILITY
LOW ACIDITY
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IMPROVED HEAT STABILITY

Methyl "Cellosolve"* Stearate
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Methyl "Cellosolve"* Palmitate
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Ask for Research Bulletin No. 101

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WILKENS-ANDERSON CO.
111 NORTH CANAL STREET • CHICAGO, ILLINOIS

	Current Low	Current High	1948 Low	1948 High	1947 Low	1947 High
Kauri, N. Y.						
Superior Pale XXX ..lb.	no prices		no prices		....	nom.
bgs ..lb.	....	.32¾	....	.32¾	....	.31
Sandarac, cks ..lb.	.95	1.50	.95	1.50	.85	1.00
Tragacanth, No. 1, cases ..lb.	3.60	8.70	3.60	8.70	3.60	8.70
No. 3 ..lb.	2.00	2.50	2.00	2.50	2.00	3.45
Yacca, bgs ..lb.	.06	.07	.06	.07	.06	.07
Hydrogen Peroxide, cbys ..lb.	.15½	.19½	.15½	.19½	.15½	.18½
Iodine, Resublimed, jars ..lb.	2.35	2.65	2.35	2.65	....	2.65
Lead Acetate, cryst, bbls ..lb.	....	.25½	....	.25½	....	.19¼
Arsenate basic, bg, lcl ..lb.	.22¾	.25	.22¾	.23¾	....	.23¾
Nitrate, bbls ..lb.	.17¾	.21½	.17¾	.21½	....	.18
Red, dry, 95% PB^3O^4 bbls ..lb.	....	.22¼	....	.22¼	.14¼	.19¼
97% Pb^3O^4 bbls, delv ..lb.	....	.22¼	....	.22¼	.15	.19½
98% Pb^3O^4, bbls, delv ..lb.	....	.22¾	....	.22¾	.15¼	.19¾
White, bbls ..lb.	.16	.16¼	.16	.16¼	.13	.17¾
Basic sulfate, bbls, lcl ..lb.	.15¼	.15½	.15¼	.15½	.12½	.15½
Lime, Chem., wks, bulk ..ton	6.50	10.25	6.50	10.25	6.50	10.25
Hydrated, f.o.b. wks ..ton	8.00	12.14	8.00	12.14	8.00	12.14
Litharge, coml, delv, bbls ..lb.	....	.21¼	....	.21¼	.13	.17½
Lithopone, ordi., bgs ..lb.	.05½	.06¾	.05½	.06¾	.03	.06
Magnesium Carb, tech, wks ..lb.	.07¼	.10¾	.07¼	.10¾	.07¼	.10¾
Chloride flake, bbls, wks c-l ..ton	....	40.00	....	40.00	....	37.00
Manganese Chloride, Anhyd. bbls ..lb.	.12¾	.19	.12¾	.19	.14	.16
Dioxide, Caucasian bgs, lcl ..ton	74.75	79.75	74.75	79.75	74.75	79.75
Mannitol, com'l., wks. ton ..lb.	.38	.40	....	....	....	....
Reagent grade, 50 lb. dms. ..lb.	....	.85	....	....	....	....
Methanol, pure, nat, dms .gal. *l*	.63	1.10	.63	1.10	.63	.73½
Synth, drs cl ..gal. *m*	.34½	.41½	.34½	.41½	.31	.41
Methyl Acetate, tech tks ..lb.	.06	.09	.06	.09	.06	.07½
C. P. 97-99%, tks, delv ..lb.	.09½	.12	.09½	.12	.09½	.10
Chloride Indust., cycl, wks ..lb.	.16	.41	.16	.41	.32	.41
Ethyl Ketone, tks, frt all'd ..lb.	....	.12½	....	.12½	....	.09
Naphtha, Solvent, tks ..gal.	....	.30	....	.30	....	.28
Naphthalene, crude, 74°, wks tks ..lb.	.04½	.07¼	.04½	.07¼	.035	.033
Nickel Salt, bbls, NY ..lb.	.14	.14½	.14	.14½	.14	.14½
Nitre Cake, blk ..ton	no stocks		20.00	24.00	....	24.00
Nitrobenzene, drs, wks ..lb.	.08½	.10	.08½	.10	.08	.09½
Orthoanisidine, bbls ..lb.	....	.80	....	.80	....	.70
Orthochlorophenol, drs ..lb.	.28	.37	....	.37	.25	.37½
Orthodichlorobenzene, drs ..lb.	.07½	.10½	.07½	.10½	.07	.10
Orthonitrochlorobenzene, wks ..lb.	.15	.18	.15	.18	.15	.18
Orthonitrotoluene, wks, drs ..lb.	.08	.11	.08	.11	.08	.09½
Paraldehyde, 98%, wks lcl ..lb.	.12½	.13½	.12½	.13½	.22	.13
Chlorophenol, drs ..lb.	.25	.29	.25	.29	.24	.29
Dichlorobenzene, wks ..lb.	.11	.14	.11	.14	.12½	.14
Formaldehyde, drs, wks ..lb.	.21	.25	.21	.25	....	.22
Nitroaniline, wks, kgs ..lb.	.41	.43	.41	.43	.41	.43
Nitrochlorobenzene, wks ..lb.	....	.18	....	.18	....	.18
Toluenesulfonamide, bbls ..lb.	....	.70	....	.70	....	.70
Toluidine, bbls, wks ..lb.	.44	.58	.44	.58	....	.53
Penicillin, ampules per 100,000 units, bulk	.10	.19	.10	.19	.14	.33
Pentaerythritol, tech ..lb.	.32	.36	.32	.36	.27	.36
PETROLEUM SOLVENTS AND DILUENTS						
Lacquer diluents, tks, East Coast ..gal.	.13	.16	.13	.16	....	.14
Naptha East, tks, wks ..gal.	.11	.14	.11	.14	....	.11
Rubber solvents, East, tks, wks ..gal.	....	.15	....	.15	....	.12
Stoddard Solvents, East, tks, wks ..gal.	.11½	.14	.11½	.14	....	.12
Phenol, U.S.P., drs ..lb.	.11¼	.14½	.11¼	.14½	.11¼	.13¼
Phthalic Anhydride, cl and lcl. wks ..lb.	.14½	.22½	.14½	.22½	.14½	.17½
Potash, Caustics, 88-92%, wks, sol ..lb.	.05¾	.09	.06¾	.09	.06¼	.07½
Flake, 88-92% ..lb.	.07½	.09½	.07½	.09½	.07	.08¼
liquid, 45% basis, tks ..lb.	....	.03½	....	.03½	....	.03½
ds, wks ..lb.	.0337½	.0375	.0337½	.0375	.03¼	.04
Carbonate hydrated 83-85%, bbls ..lb.	.05¾	.06	.05¾	.06	.06	.05¾
Chlorate crys, kgs, wks ..lb.	.08½	.09¾	.08½	.09¾	.08½	.13
Chloride, USP, cryst, bbls ..lb.	.21	.27	.21	.27	.21	.22
Cyanide, drs, wks ..lb.	....	.55	....	.55	....	.55
Iodide, drs ..lb.	1.95	1.98	1.95	1.98	1.44	1.98
Muriate dom, 60-62-63% K^2O bulk unit-ton	.37½	.58½	.37½	.58½	.37½	.53½
Permanganate, USP, wks drs ..lb.	.22½	.24	.22½	.24	.20½	.23
Sulfate, 90%, basis, bgs ..ton	32.50	39.25	32.50	39.35	36.25	39.25
Propane, group 3, tks ..gal.	.03½	.06¾	.03½	.06¾	.03½	.06¾
Pyridine, reg., drs ..lb.	.60	.70	.60	.70	.55	.65
R Salt, 250 lb bbls, wks ..lb.	.61	.72	.61	.72	....	.72
Resorcinol, tech. drs, wks ..lb.	....	.68	....	.68	.64	.74
Rochelle Salt, cryst ..lb.	.31½	.35	.31½	.35	.32½	.35
Salt Cake, dom, blk wks ..ton	20.00	28.00	20.00	28.00	....	26.00
Saltpeter, grn, bbls ..100 lbs.	8.75	10.25	8.00	10.25	8.20	9.50

l Producers of natural methanol divided into two groups and prices vary for these two divisions; *m* Country is divided into 4 zones, prices varying by zone. Spot price is ½c higher.

Current Prices

Shellac Oils & Fats

	Current Low	Current High	1948 Low	1948 High	1947 Low	1947 High
Shellac, blchd, bone dry, bbls. lb.	.58½	.77	.58½	.77	.58½	.74½
Silver Nitrate, bots, 2,500-oz. lots oz.	.42¼	.48	.42¼	.48	.42¼	.59
Soda Ash, 58% dense, bgs, c-l, wks 100 lbs.	.....	1.50	.....	1.50	...	1.38
58% light, bgs cl 100 lbs.	.....	1.40	.....	1.40	.....	1.30
Caustic, 76% flake drs, cl 100 lbs.	.....	3.45	.....	3.45	2.90	3.25
76% solids, drs, cl 100 lbs.	.....	3.05	.....	3.05	2.50	2.85
Liquid, 47-49%, sellers, tks 100 lbs.	.....	2.10	.....	2.10	.....	2.10
Sodium Acetate, anhyd. drs. lb.	.06½	.11½	.06½	.11½	.06½	.11
Benzoate, USP drs. lb.	.46	.52	.46	.52	.46	.52
Bicarb. USP, gran., bgs. cl., works 100 lbs.	.....	2.35	.....	2.35	.225	2.59
Bichromate, bgs, wks l.c.l. lb.	.08¾	.09¾	.08¾	.09¾	.07⅞	.09¼
Bisulfate powd, bbls, wks 100 lbs.	3.00	3.60	3.00	3.60	3.00	3.60
35° bbls, wks 100 lbs.	1.10	1.65	1.10	1.65	1.40	1.65
Chlorate, kgs, wks cl. lb.	.....	.07¼	.....	.07¼	.....	.06¾
Cyanide, 96-98%, drs. lb.	.14½	.15½	.14½	.15	.14½	.15½
Fluoride, 95%, bbls, drs. lb.	.09¾	.10	.09¾	.10	.07¼	.10
Hyposulfite, cryst. bgs, cl. wks. 100 lbs.	.....	3.00	.....	3.00	.....	2.75
Metasilicate, gran., bbl. wks. c-l. 100 lbs.	3.25	3.40	3.25	3.40	.....	3.40
Nitrate, imp, bgs. c-l ton	.....	51.50	.....	51.50	.....	42.50
Nitrite, 96-98% bbl, cl. lb.	.....	.06¾	.....	.06¾	.....	.06¾
Phosphate, dianhyd, bgs, wks 100 lbs.	6.25	7.80	6.25	7.80	6.00	7.00
Tri-bgs, cryst, wks 100 lbs.	3.40	3.90	3.40	3.90	2.70	3.90
Prussiate, yel. bbls, wks lb.	.12	.12¼	.12	.12¼	.....	.12¼
Silicate, 52°, drs, wks. 100 lbs.	1.55	2.00	1.55	2.00	1.40	2.00
40°, drs, wks, c-l 100 lbs.	.95	1.15	.95	1.15	.....	1.15
Silicofluoride, bbls, NY lb.	.05	.08½	.05	.08½	.06¼	.08½
Sulfate tech. Anhyd, bgs. 100 lbs.	2.10	2.60	2.10	2.60	1.70	2.60
Sulfide, cryst c-l, bbls, wks. 100 lbs.	.....	3.75	.....	3.75	.....	3.00
Solid bbls, wks lb.	3.50	5.50	3.50	5.50	3.05	5.50
Sorbitol, c-l., wks lb.	.25½	.26	.....	.....	.....	.....
Starch, Corn, Pearl bgs. 100 lbs.	6.37	7.17	6.37	7.17	4.99	7.17
Potato, bgs, cl. lb.	.08	.1180	.08	.1180	.0875	.1075
Rice, bgs. lb.	no stocks		no stocks		no stocks	
Sweet Potato, bgs. lb.	no stocks		no stocks		no stocks	
Sulfur, crude, mines ton	16.00	18.00	16.00	18.00	16.00	18.00
Flour, USP, precp, bbls, kgs. lb.	.18	.30	.18	.30	.18	.36
Roll, bbls 100 lbs.	2.45	3.40	2.45	3.40	2.65	3.40
Sulfur Dioxide, liquid, cyl. lb.	....	.09	.....	.09	.07	.095
tks, wks. lb.	.04½	.05	.04½	.05	.....	.044
Talc, crude, c-l, NY ton	.....	15.00	.....	15.00	.....	15.50
Ref'd c-l, NY ton	14.50	24.50	14.50	24.50	14.50	24.50
Tin, crystals, bbls, wks lb.	.55	.71½	.55	.71½	.....	.60
Metal lb.	.....	1.03	.....	1.03	.....	.80
Toluol drs, wks, gal.	.28	.37	.28	.37	.28	.29½
tks, frt all'd gal.	.....	.23	.....	.23	.....	.23
Tributyl Phosphates, drs, lcl, frt all'd lb.	.66	.72	.66	.72	.....	.72
Trichloroethylene, drs, wks. lb.	.09¼	.10½	.09¼	.10½	.08	.10½
Tricresyl phosphate tks lb.	.32¼	.46½	.32¼	.46½	.32¼	.33
Triethylene glycol, drs. lb.	.18½	.20½	.18½	.20½	.18½	.19½
Triphenyl Phos., bbls. lb.	.26	.31	.26	.31	.26	.32
Wax, Bayberry, bgs. lb.	.52	.55	.52	.55	no stocks	
Bees, bleached, U.S.P. cakes lb.	.65	.73	.65	.73	.68	.73
Candelilla, bgs, crude lb.	.61	.65	.61	.65	.62	.80
Carnaube No. 1, Yellow, bgs, ton lb.	1.18	1.55	1.18	1.55	1.30	2.00
Xylol, Indus., frt all'd, tks wks. gal.	.28	.30	.23	.30	.....	.23
Zinc Chloride tech, fused, wks. lb.	.0625	.0655	.0625	.0655	.05	.0655
Oxide, Amer., bgs, wks. lb.	.....	.13½	.08½	.13½	.09	.10
Sulfate, crys, bgs. 100 lbs.	4.15	4.90	4.15	4.90	3.40	4.90
OILS AND FATS						
Babassu, tks. lb.	.14½	.28½	.14½	.28½	.14½	.27½
Castor, No. 3, drs, c.l. lb.	.20½	.34¼	.26½	.34¼	.27¾	.34¾
China Wood, drs, spot NY, lb.	.21½	.27	.21½	.27	.24	.41
Coconut, edible, drs Atlantic ports. lb.	.18	.27	.18	.27	.18	.37
Corn, crude, tks, wks lb.	.24½	.32	.....	.32	.....	.31
Linseed, Raw, drs. c.l lb.	.2900	.3430	.2900	.3430	.3160	.3960
Menhaden, crude tks	.15	.22	.15	.22	.19	.22
Light, pressed, drs l.c.l. lb.	.16	.26	.16	.26	.16	.29
Palm, Niger, drms. lb.	no prices		no prices		no prices	
Peanut, crude, tks, f.o.b. wks. lb.	.17	.30	.17	.30	.20	.37
Perilla, crude, drms, NY lb.	no stocks		no stocks		no stocks	
Rapeseed, bulks lb.	no prices		no prices		no prices	
Red, drms. lb.	.17¾	.33¾	.17¾	.33¾	.17¾	.33¾
Soy Bean, crude, tks, wks. lb.	.15½	.29¾	.15½	.29¾	.15½	.33
Tallow, acidless, drms. lb.	.18	.35	.18	.35	.19½	.35

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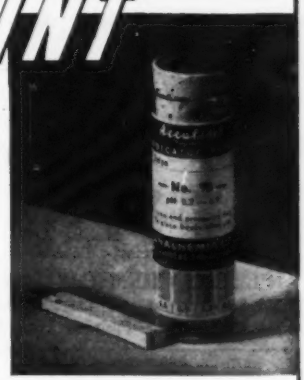

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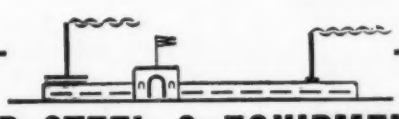

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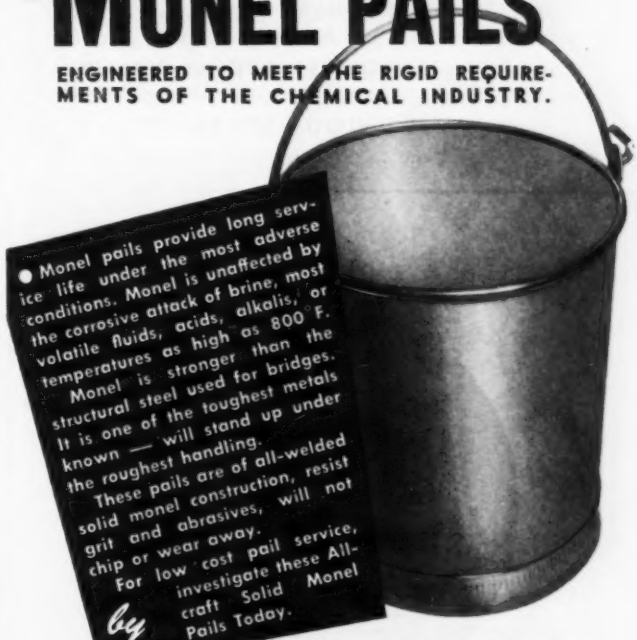

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Powell Co., The Wm..... 649
Prior Chemical Corp..... 571

Quaker Oats Co..... 718

Raymond Bag Co..... 722
Reichhold Chemicals, Inc..... 691
Reilly Tar & Chemical Corp..... 626
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Rosenthal Bercow Co., Inc..... 711
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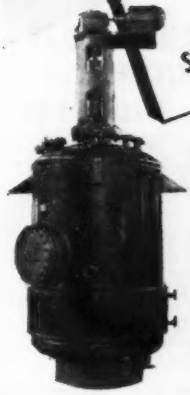

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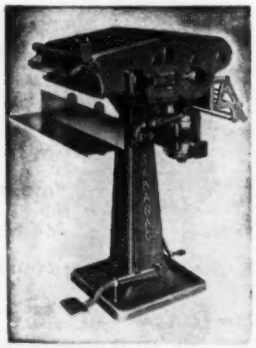

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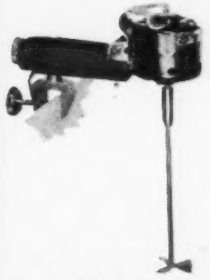

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Overall height, 14".
110 to 115 AC motor, 1/150-1500 RPM.
Two sizes of corrosion-resistant stainless steel shafts with agitating paddles.
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"WE" — EDITORIALLY SPEAKING

HERE'S A "New Chemical for Industry" that we regretfully omitted from this year's listings. We figured we didn't have many Soap Box Derby contestants among

our readers. We sure hope the stuff contains extreme-pressure additives, corrosion inhibitors, viscosity index improvers, and all that sort of thing.

FRIEND OF OURS is connected with the new Enzyme Institute at the University of Wisconsin and he carries an identification card in his billfold that says so. Most frequent use of the card, he tells us, is his whipping it out to show people how to spell "enzyme."

LIFE, WE DECIDED after reading about Mr. Quinn Morton, is becoming too complex. Said Morton agreed to pay Dr. Peter, a consulting chemist, $10 for finding a better way of condensing milk than that revealed in Borden's patent. That was in 1870. Today a research group of six, a library of 2,000 volumes, a three-story building and an annual research budget of $78,000 for four years would be required to make a dent in a problem like that.

IF YOU'RE STARRED IN *American Men of Science*, you'll live longer! According to an item we just read, starred chemists live a year beyond the Biblical allotment, six years over the average, while their unstarred brethren die ten years earlier, at 61. It appears as if Destiny doesn't offer us a choice or fame or longevity; we get both or neither.

FIFTEEN YEARS AGO

(From Our Files of October, 1933)

Designers and producers of chemical equipment have organized an association, the Chemical Engineering Institute. The primary purpose of the Institute will be to act as an intermediary between the industry and the government, and to have a fair practices policy in readiness for the NRA officials.

Bromine-from-seawater commercial production is promised in 6 months by Ethyl-Dow Chemical Co., at a plant at Kure Beach, about 20 miles south of Wilmington, N. C. The unit will have an initial capacity of 500,000 lbs. of bromine a month.

Although relatively losing ground as compared with the U. S. and Great Britain, Germany was able to maintain its status as the world's leading chemical exporter in the first half of this year. Total value of Germany's exports was $83,850,000; those of the U. S., $46,300,000; and those of Great Britain, $39,050,000.

Work is being pushed at Corpus Christi, Texas to complete the alkali plant of Pittsburgh Plate Glass and Cyanamid. The Southern Alkali Corp. will operate the unit, which is on a 300-acre site on the harbor.

THIRTY YEARS AGO

(From Our Files of October, 1918)

The Fourth National Exposition of Chemical Industries was held in the Grand Central Palace, New York.

The government will establish a plant at Clinchfield, Va., for recovery of toluol, sulfate of ammonia, valuable oils and other by-products from bituminous coal by a new process of low temperature distillation.

The House of Commons has voted £1,000,000 to be devoted to promoting the manufacture of aniline dyes in Great Britain.

The Central Chemical Co., Hagerstown, Md., has increased its capital from $200,000 to $600,000 for proposed extensions at its works.

WE HAVE COMMENTED from time to time on the two kinds of "science" in the Soviet Union: Soviet science, of course, and "bourgeois-capitalist science." *The Wall Street Journal's* editorial comments on the latest nonsensities over there are too good not to repeat:

"Bourgeois science has had its comeuppance. Western theories of genetics, the study of inheritance factors, have been swept aside by Soviet Russia because they are not "idealistic" enough.

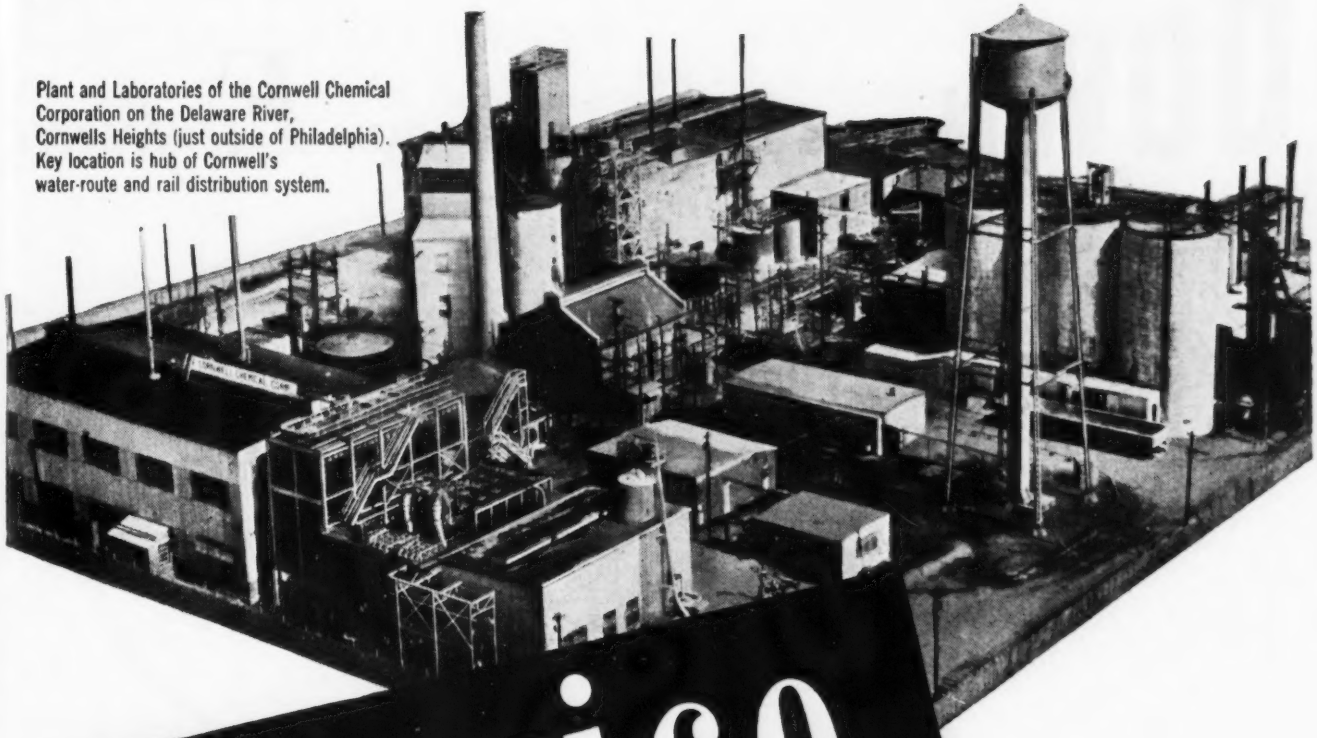
"Western scientists, following Mendel (a Catholic priest), believe that the inheritance of one generation from its parents follows fixed laws applicable to plants, animals and people. Thus, acquired characteristics of one generation are not passed on to the next. The Soviet doctrine is that this is unfair to posterity and hence cannot be countenanced.

"The bourgeois view did not bow easily. T. D. Lysenko, who sponsored the new party line, has spent ten years trying to convince other Russian scientists that they were swallowing western propaganda. A few reactionaries clung to the old-fashioned laboratory data as late as this month, when a soviet conference of geneticists was held.

"*Pravda* relates how the change came about. Mr. Lysenko read a paper attacking the Mendelian theory. The classicists spoke up vigorously until Mr. Lysenko announced that his paper had been approved by the Central Committee of the Communist Party. The opposition then faded and a unanimous resolution was adopted repealing Mendel's law.

"All textbooks will be rewritten to eliminate foreign views of biology. New pupils, to greater glory of science, will get the unadulterated party truth."

"It's about a chemical specialty—a new vanishing cream."



Plant and Laboratories of the Cornwell Chemical Corporation on the Delaware River, Cornwells Heights (just outside of Philadelphia). Key location is hub of Cornwell's water-route and rail distribution system.

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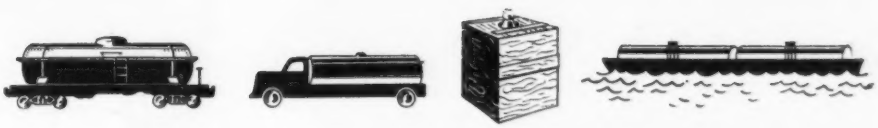

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In light of this new price reduction, you will want to re-evaluate furfural in processes and products involving its use as a selective solvent, resin ingredient, chemical intermediate, general solvent, and wetting agent.

Principal properties of furfural are indicated in the following table. Technical Data Sheets, available upon request, give additional information on specific subjects. Write for copies on your company letterhead indicating the general nature of your interest.

PHYSICAL CONSTANTS OF PURE FURFURAL

Molecular Weight	96.08
Freezing Point, °C	−36.5
Boiling Point, °C	161.7
Specific Gravity (20/4°C)	1.1598
Flash Point (open cup) °C	56.8
Refractive Index (20°C)	1.5621
Surface Tension at 20°C (dynes/cm)	49
Viscosity (centipoises)	
38°C	1.35
54°C	1.09

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U. S. Patents from Official Gazette — Vol. 609, Nos. 3, 4; Vol. 610, Nos. 1, 2, 3, 4; Vol. 611, Nos. 1, 2, 3. (April 20 - June 15) Canadian Patents Granted and Published June 22 - August 3

*Specialties

Canadian

A dust suppression composition comprising an aqueous dispersion of a water soluble salt of a sulphated aliphatic alcohol and an adhesive substance. No. 448,760. Malcolm Watson and Constance E. Watson (to Shell Development Company).

Flame-resistant article comprising a base structure having a coating of a bituminous flame-resistant composition. No. 448,535. John W. Olson and Charles W. Bechle (to Anaconda Wire and Cable Company).

Bituminous flame-resistant composition. No. 448,534. John W. Olson and Charles W. Bechle (to Anaconda Wire and Cable Company).

Bituminous flame-resistant composition. No. 448,533. John W. Olson and Charles W. Bechle (to Anaconda Wire and Cable Co.).

*Textiles

Medullated artificial filaments. No. 2,439,039. Elvin L. Coe (to American Viscose Corp.).

Method of making bitumen coated fibrous material. No. 2,438,890. Charles M. Baskin (to Standard Oil Development Co.).

Building element consisting of alternate laminations of sheets of fibrous material and of composition composed of emulsion of sodium silicate of 40° to 47° Bé., high boiling mineral oil, tung oil, mica filler and titanium dioxide. No. 2,438,339. Maurice Jacobs (to Albert W. Clurman).

Producing composite flexible fabric to resist penetration of liquid and gaseous chemical warfare agents. No. 2,438,176. Louis Amédée Lantz and Arthur Schofield (to The Calical Printers' Association Limited).

Canadian

Manufacture of a compound fabric which comprises treating a fabric with a solution of an initial condensation product of a thermosetting synthetic resin obtained by the condensation of a substance consisting of urea and derivatives of urea and formaldehyde and a solution of a water insoluble thermoplastic resin. No. 448,716. Hans Meyer (to Hart Productions Limited).

Textile material adapted for industrial use comprising a resin-impregnated stiffened woven fabric. No. 448,582. Ross C. Whitman (to The Kendall Company).

*Water, Sewage and Sanitation

Watertreating apparatus. No. 2,439,764. James D. Walker (to The American Well Works).

Agricultural

A composition comprising a volatile liquid insecticide and a vehicle therefor consisting of dry hard rubber in finely divided form. No. 2,440,781. Charles W. Murray (to United States of America).

Insecticidal composition comprising pyrethrum and 1,3 diphenoxypropane. No. 2,441,433. Edward R. McGovran and Wilbur A. Gersdorff.

Biochemical

Improvement in the method of **producing penicillin** in submerged culture by incorporating in the nutrient a member of the group consisting of N-phenylacetyl α-amino-β,β-dimethylacrylic acid. No. 2,440,355. Otto K. Behrens (to Eli Lilly and Company).

Growing a penicillin mold in a culture medium in the presence of a compound characterized by the presence of its 1-configuration isomer C_6H_5-CH_2Co-NH-CH(COOH) $CHRR_1$ wherein R represents a member of the group consisting of hydrogen, methyl and thyl and R_1 represents an alkyl radical having not more than two carbon atoms, and salts and lower alkyl esters of said acids. No. 2,440,356. Otto K. Behrens (to Eli Lilly and Co.)

Producing penicillin in the presence of an N-alkenyl-phenyl acetamide of the group consisting of N-allyl-phenylacetamide, N-crotyl-phenlacetamide, N-(2-methyiallyl)-phenylacetamide, N-(3-ethylallyl)-phenylacetamide and N-(3,3-dimethylallyl)-phenylacetamide. No. 2,440,357. Otto K. Behrens and Quentin F. Soper (to Eli Lilly and Company).

Producing penicillin in the presence of N-(2-aminoethyl)—phenylacetamide and acid addition salts thereof. No. 2,440,358. Otto K. Behrens and Reuben G. Jones (to Eli Lilly and Company.

Producing penicillin in the presence of N-(2-hydroxyethyl)-phenylacetamide, N-(2-hydroxypropyl)-phenylacetamide, and N-(2-hydroxybutyl)-phenylacetamide. No. 2,440,359. Otto K. Behrens, Reuben G. Jones, and Joseph W. Corse (to Eli Lilly and Company).

Producing penicillin in the presence of C_6H_5-CH_2-CO-NH-CH_2-$C(R)_2$-OR_1 wherein each R represents a member of the group consisting of hydrogen, methyl and ethyl, and R_1 represents a member of the group consisting of methyl, ethyl, propyl and isopropyl. No. 2,440,360. Otto K. Behrens and Reuben G. Jones and Joseph W. Corse (to Eli Lilly and Company).

Producing penicillin in the presence of C_6H_5-CH_2-CO-NH-CH_2-$C(R)_2$-OR_1 wherein each R represents a member of the group consisting of hydrogen, methyl and ethyl, and R_1 represents a member of the group consisting of acetyl, propionyl, butyryl and phenylacetyl. No. 2,440,361. Otto K. Behrens and Reuben G. Jones and Joseph W. Corse (to Eli Lilly and Company).

Production of alcohol by fermenting a body of mash with yeast. No. 2,440,925. Benjamin Clark Boeckeler (to 9,448/10,570 Chemprotin Products, 561/10,570 Laszlo Kormendi, 561/10,570 B. Clark Boechkeler).

Process for the recovery of hesperidin from plant material. No. 2,442,110. Willard E. Baier (to California Fruit Growers Exchange).

Isolating lysozyme from mixture with other biologic components comprising adding an adsorbent selected from the group consisting of a finely divided clay, a synthetic zeolite, and an organic ion exchanger to adsorb the lysozyme. No. 2,442,452. Gordon Alderton and Harry L. Fevold (to U. S. A. as represented by Secretary of Agriculture).

Preparation of lactic-acid bacteria not containing casein. No. 2,442,502. Erik Gunnar Mejlbo (to A/S Enico).

Cellulose

Plugging a porous formation in a well by introducing an aqueous solution of sodium carboxymethylcellulose and an aqueous solution of a salt selected from a group consisting of ferrous sulphate, ferric chloride, barium nitrate, stannous chloride, basic lead acetate and aluminum sulphate, to react and form a water insoluble precipitate. No. 2,439,833. Cary R. Wagner (to Phillips Petroleum Company).

Plastic cellulose composition comprising a solid cellulosic derivative selected from the group consisting of cellulose esters and cellulose ethers, and between about 1% and about 10% ammonium thiocyanate. No. 2,440,201. Joseph H. Klaber and Johan Bjorksten (to Quaker Chemical Products Corp.)

Plastic cellulosic composition comprising a solid cellulosic derivative selected from the group consisting of cellulose esters and cellulose ethers and between about 1% and about 12% of a substance selected from the group consisting of thiourea and alkyl substituted thioureas. No. 2,440,202. Joseph H. Klaber and Johan Bjorksten (to Quaker Chemical Products Corp.)

Starch stabilizer of abnormally low settling rate comprising a mixture of pregelatinized and nongelatinized starch. No. 2,442,658. Robert L. Lloyd (to American Maize-Products Co.)

Method and apparatus for the production of starch. No. 2,443,310. Carl Goran Eckers (to Aktiebolaget Separator).

Cellulose compound containing a plasticizer formed from a diolefin and formaldehyde. No. 2,443,409. Thomas C. Whitner (to Standard Oil Development Co.)

Canadian

Solvent for regenerated cellulose made from an aqueous solution of alkali metal hydroxide, urea, and alkali metal stannate. No. 449,556. Charles L. Mantell (to United Merchants & Manufacturers, Inc.)

Composition of matter consisting of a cellulose derivative selected from the group consisting of cellulose esters and cellulose ethers and, to reduce the destructive action of ultra violet light an ester selected from the group consisting of dihydroxy benzenes and dihydroxy naphthalenes having each hydroxyl group esterified with an aromatic hydroxy carboxylic acid. No. 449,579. William John Simpson and Donald Finlayson (to Camille Dreyfus).

Hydrolizing cellulosic material without substantial saccharification by sulphuric acid. No. 450,224. John Lake Keays.

Ceramics

Method of making a colorless fluorescent silicate glass which comprises introducing into a batch containing a copper compound ammonium chloride. No. 2,440,048. Harrison P. Hood (to Corning Glass Works).

Forming a refractory comprising forming a mixture of a high aluminous silicate ball clay, an infra-red absorbing ingredient

*U. S. Patents from Vol. 607, Nos. 2, 3, 4. Vol. 608, Nos. 1, 2, 3. Canadian from May 18-June 15

and water. No. 2,440,187. Carl G. Silverberg (to American Optical Company).

Ceramic pigment compositions consisting of oxides of zirconium silicon and vanadium. No. 2,441,447. Clarence A. Seabright (to The Harshaw Chemical Company).

Glass containing P_2O_5, alumina, borix oxide, lead oxide and an alkali oxide. No. 2,441,853. John Edwin Stanworth (to General Electric Co.)

Amber glass containing sulfur as a coloring material and comprising SiO_2, alkali, iron, and a small amount of fluorine. No. 2,443,142. Aaron K. Lyle (to Hartford-Empire Co.)

Making titanate dielectric ceramic. No. 2,443,211. Eugene Wainer and Allen N. Salomon (to The Titanium Alloy Mfg. Co.)

Rendering glass fibres resistant to abrasion by first chemically etching the surface of the glass fibres and then coating the same with an abrasion resistant coating material. No. 449,747. Saul Alexander Hartman.

Coatings

Preparing a liquid coating composition by polymerizing a drying oil containing a polymerization catalyst of the Friedel-Crafts type. No. 2,440,000. Henry G. Berger and George S. Cranda l and John F. Socolofsky (to Socony-Vacuum Oil Co.)

Coating composition containing less than one-half percent of water and from 55 to 67 percent by weight of daid dye, wax being present and oil being present in greater amount than the wax. No. 2,440,364. William J. Champion (to Ditto, Inc.)

Production of synthetic drying oils from an oleffinic hydrocarbon charging stock in the presence of hydrogen fluoride. No. 2,440,459. Herman S. Bloch (to Universal Oil Products Company).

Liquid coating composition comprising a constituent capable of forming a dried film upon oxidation, said constituent being (a) drying fatty oils; (b) semi-drying fatty oils; (c) mixtures of drying and semi-drying fatty oils, and elemental sulfur. No. 2,440,467. Vincent J. Frilette (to Ridbo Laboratories, Inc.).

Preparation of a drying oil by reacting a hydrocarbon fraction containing olefins in the presence of a hydrogen fluoride catalyst. No. 2,440,477. Warren W. Johnstone (to Universal Oil Products Company)

Coating composition comprising an oil-in-water emulsion in which the inside phase contains a titanium dioxide pigment in addition to a member of the group which consists of drying oil modified alkyd resins, semi-drying oil modified alkyd resins, and oleo-resinous varnishes, the pigment particles being coated with an amphoteric metal compound. No. 2,440,953. John W. Iliff and Martha Torrey (to E. I. du Pont de Nemours & Company).

A drying oil which comprises an oil selected from the class consisting of drying and semi-drying oils in which non-drying constituents are replaced by an aliphatic di-carboxylic acid. No. 2,440,667. Latimer D. Myers and Victor J. Muckerheide (to Emery Industries, Inc.).

Producing a hard protective coating on a ferrous metal surface by applying metallic zinc and lead oxide in an aqueous solution of an alkali silicate and sodium bicarbonate. No. 2,440,969. Victor Charles John Nightingall (to Di-Met Proprietary Limited).

Producing decorative wrinkled films with a wrinkling varnish base prepared by contacting material selected from the group consisting of oiticica oil, China-wood oil, perilla oil, and dehydrated castor oil, with a bodying catalyst selected from the group consisting of boron trifluoride and anhydrous hydrofluoric acid. No. 2,441,105. John F. Soccolofsky and Henry G. Berger (to Socony-Vacuum Oil Company).

Making a wrinkling oil from an ester of non-wrinkling oil fatty acids which consists in heating with allyl cobalt. No. 2,441,738. Gordon M. Williams (to New Wrinkle, Inc.).

Making a wrinkling oil from untreated normally non-wrinkling oil which consists in heating with lead dipropyl. No. 2,441,739. Gordon M. Williams (to New Wrinkle, Inc.).

A coating composition comprising clay, a calcareous filler, a binder and a mucilageinous substance selected from the group consisting of methyl cellulose, water soluble alginates and carbohydrate gums. No. 2,441,927. Alexander Adams (to United States Gypsum Co.).

Obtaining a resistant finish on wood surfaces by applying a thin dispersion of a mixture of an alcohol-soluble urea-formaldehyde resin and an oil modified glycerol-polycarboxylic acid resin in a volatile solvent. No. 2,441,953. William E. Berry and Melville M. Wilson (to Interchemical Corp.).

Composition for protecting ships bottoms comprising a low water absorption plastic in which is incorporated the toxic ptomaines and poisons resulting from the decomposition and putrefaction of nitrogenous materials. No. 2,443,033. Charles J. Greenstreet (to Universe Holding Corp.).

Synthetic drying oil prepared by subjecting aromatic hydrocarbon material consisting largely of dimethyl naphthalenes and trimethyl naphthalenes, to exhaustive catalytic hydrogenation; chlorinating the product to yield a chlorinated product; and dehydrochlorinating in the presence of calcium oxide. No. 2,443,079. Ferdinand P. Otto (to Socony-Vacuum Oil Co.).

A wrinkle finish coating composition. No. 2,443,212. William Allshire Waldie (to New Wrinkle, Inc.).

Wrinkling oil composition from non-wrinkling oils consisting in heating a glycol with a non-conjugated double-bonded oil. No. 2,443,284. William A. Waldie (to New Wrinkle, Inc.).

Manufacture and production of lacquers and plastic masses by dissolving an organic film-forming substance. No. 2,443,374. John George Mackay and David Gwyn Jones and Stephen Frederick Pearce and Laurence Michael Smith (to Imperial Chemical Industries Limited).

Canadian

Pigmented coating composition containing a resin selected from the group consisting of alkyd and phenol formaldehyde resins modified with a drying fatty oil, a pigment and litharge, and calcium hydrate. No. 449,808. Ladislaus Balassa (to Canadian Industries Ltd.).

Dyes, Pigments

Methine dyestuffs. No. 2,440,119. Oskar Riester and Gustav Wilmanns (to General Aniline & Film Corporation).

Improving the fastness of dyed organic derivative of cellulose textiles by impregnation with cyanamide. No. 2,440,330. Henry Dreyfus; Claude Bonard (to Celanese Corporation of America).

Water-soluble anthraquinone dyes. No. 2,441,355. Paul Grossmann (to Society of Chemical Industry in Basle).

Vat dyestuffs of the benzathrone anthraquinone thioxanthene series. No. 2,441,512. Mario Scalera (to American Cyanamid Co.).

Carbocyanine dyes containing a mesocycloalkyl group. No. 2,441,529. Leslie G. S. Brooker and Grafton H. Keyes (to Eastman Kodak Company).

Merocarbocyanine dyes containing a cycloalkyl group on the dimethine chain. No. 2,441,530. Leslie G. S. Brooker and Grafton H. Keyes (to Eastman Kodak Company).

Irreversibly converting an aminotriarylacetronitrile into a stable dye. No. 2,441,561. Lyman Chalkley.

An azo dye obtainable by coupling diazotised 6-methoxy-4'-amino-2'-methyl-5'-methoxy-benzene-1'-azo-2-benzthiozole with a para coupling N-dialkyl-aniline. No. 2,441,612. Christopher Stanley Argyle and Sydney Alfred Gibson (to Celanese Corp. of America).

Manufacture of crystalline nitroazo compounds by diazotizing in a ring-substituted primary aromatic amine, mixing and coupling the resulting diazonium salt solution with a low-molecular-weight secondary nitroalkane. No. 2,441,800. Edward Franklin Degering and Charles F. Feasley (to Purdue Research Foundation).

Improvement in manufacture of ultramarine which comprises forming the ultramarine mix into strong briquets before subjecting them to firing step. No. 2,441,950. Alling P. Beardsley and Stanley H. Whiting (to American Cyanamid Co.).

Process of producing high sulfur "secondary ultramarine" containing at least 10% of combined sulfur by a process in which "primary ultramarine" is first produced and is then oxidized to "secondary ultramarine," the improvement which comprises carrying out at least the major and later portion of the oxidation of the "primary ultramarine" by means of sulfur dioxide as an oxidizing agent in the absence. No. 2,441,951. Alling P. Beardsley and Stanley H. Whiting (to American Cyanamid Co.).

In a two-step process for producing high strength, high sulfur "secondary ultramarine" in which a raw, high sulfur ultramarine charge is fired to form "primary ultramarine" followed by controlled oxidation of the "primary ultramarine" to "secondary ultramarine," the improvement which comprises maintaining the charge in the first step substantially free from chemically reactive gases, cooling, and carrying out the oxidation of the "primary ultramarine" in a separate step. No. 2,441,952. Alling P. Beardsley and Stanley H. Whiting (to American Cyanamid Co.).

A continuous process for the production of "primary ultramarine." No. 2,442,173. William J. Kruppa, Alling P. Beardsley and Stanley H. Whiting (to American Cyanamid Co.).

Azo compounds having the general formula R—N=N—R_1 wherein R—N=N— stands for the residue of a diazotized member selected from the group consisting of a monocyclic arylamino compound of the benzene series, an arylamino compound of the naphthalene series containing no cyclic nucleus other than a single naphthalene nucleus and an aminoazobenzene and R_1 stands for a coupling component selected from the group consisting of a trifluoromethylbenzomorpholine compound and trifluoromethyl-1,2,3,4-tetrahydroquinoline compound and wherein said coupling components are joined to the azo bond through the carbon atom in the 6-position. No. 2,442,345. Joseph B. Dickey, James G. McNally (to Eastman Kodak).

Methine dyestuffs. No. 2,442,710. Oskar Riester (to General Aniline & Film Corp.).

Dyeing material by the metachrome process which comprises subjecting the material to be dyed to the action of a dye bath containing a metallizable azo dye having acid groups suitable for dyeing the material, a compound of a metal capable of metallizing the dye, a cationic surface active agent and a non-ionic surface active agent selected from the group consisting of condensation products of polyglycols with higher fatty acids, condensation products of polyglycols with amides of higher fatty acids, and condensation products of polyglycols with long-chain alkyl substituted phenols. No. 2,443,166. Henry E. Millson and George L. Royer (to American Cyanamid Co.).

Metallized pyrazolone azo dyes. No. 2,443,226. Boyce Galloway Carson (to E. I. DuPont de Nemours & Co.).

Benzthiazyl azo dyes made by hydrolyzing a p:p'-di-(6-methylbenzthiazyl) azobenzene-bis (N-substituted-4-thiocyanosulfonanilide) by heating in solution in which a crystalline alkali metal sulfide is dissolved. No. 2,443,314. Norman Hulton (to Imperial Chemical Industries Limited).

Canadian

Azo dyes. No. 450,257. Christopher Stanley Argyle and Sydney Alfred Gibson (to Canadian Celanese Ltd.).

Azo dyes. No. 450,258. Henry Charles Olpin and John Wright (to Canadian Celanese Ltd.).

Equipment

Vacuum operated three-way valve. No. 2,439,863. Anton Rappl (to Trico Products Corporation).

Float valve. No. 2,439,864. Thomas Ritchie (to Charles B. Wade).

A pump for highly volatile liquids. No. 2,439,957. Carl R. Anderson (to Air Products Incorporated).

A pump having a cylinder, a plunger reciprocating therein and packing surrounding said plunger within said cylinder. No. 2,439,958. Carl R. Anderson (to Air Products Incorporated).

Intermitten flow device. No. 2,440,006. Frank Y. Donaldson.

Lift check valve. No. 2,440,027. Ludwig T. Stoyke (to Crane Co.).

Fluid flow regulator. No. 2,440,059. James Olcott and Allan C. Hoffman (to United Aircraft Products, Inc.).

Apparatus for measuring the radiation intensity of slow neutrons separately from that of other coexistent penetrating radiations such as gamma rays or fast neutrons. No. 2,440,167. James W. Broxon and William P. Jesse (to United States of America).

Multiple effect still with thermocompression of vapors. No. 2,440,172. Roy O. Henszey.

Reciprocating pump for liquefied gases. No. 2,440,216. Carl R. Anderson (to Air Products, Inc.).

Pulverizing and classifying machine. No. 2,440,285. Henry G. Lykken and William H. Lykken.
Double-acting pump. No. 2,440,411. John T. Leonard.
Catalyst chamber closure. No. 2,440,436. William Hunt Creel (to Phillips Petroleum Company).
Separating solids from their suspension which comprises a horizontal drum of electrical conducting material partially submerged in said slurry, a semi-cylindrical pan electrode, means for connecting a source of potential across said pan electrode and said drum to effect the electrophoretic deposition of solids onto said drum. No. 2,440,504. Harmon F. Fisher and Albert C. Peck (to The Permanente Metals Corporation).
Two-stage pump. No. 2,440,560. Allan G. Sheppard (to American-La France-Foamite Corp.).
Radial vane pump mechanism. No. 2,440,593. Harry B. Miller.
Converting refined clay filter cake to a pumpable aqueous suspension and for enhancing the resistance of the suspended clay particles to settling on standing by dispersing and fluidizing the clay filter cake with the aid of a deflocculating agent. No. 2,440,601. Gilbert K. Dickerman (to Consolidated Water Power and Paper Company).
Relief valve. No. 2,440,608. Frank B. Hunter (to Casimir A. Miketta).
Pumping system. No. 2,440,611. John Mann (to Goulds Pumps).
A gear pump. No. 2,440,624. Ernest E. Wemp.
Electron microanalyzer. No. 2,440,640. Ladislaus Marton (to Research Corp.).
A composite plastic lined metal pipe. No. 2,440,725. Charles G. Munger (to American Pipe and Construction Co.).
Evaporating and drying apparatus. No. 2,440,778. Joseph W. Maglaughlin.
Regenerating a solid desiccating agent. No. 2,440,784. William E. Perdew (to Globe Oil & Refining Co.).
Tube for a heat exchanger comprising a metal tube having a helical fin spirally wound. No. 2,440,803. Edward S. Lea (to Doyle & Roth Company).
Tumbling mill. No. 2,440,819. Archibald D. Evans (to Pangborn Corp.).
Rotary compressor. No. 2,440,865. Frank W. Lynch and Thomas Castberg (to themselves and Hurford Sharon).
Axial piston pump. No. 2,440,875. Wendell E. Renick (to The Denison Engineering Company).
Adjustable two layered screen for hammer mills and remote control therefor. No. 2,440,927. Floris Boss and Earl Nemic.
Control valve. No. 2,440,942. Clarence H. Gilbert.
Valved joint. No. 2,440,946. Fred E. Hansen.
Centrifugal pump with impeller supporting wear rings. No. 2,440,947. Edward Hart (to A. O. Smith Corporation).
Control valve for controlling movement of a fluid acturated plunger operating in a cylinder. No. 2,440,948. Donald E. Hawkins and Ronald S. Hawkins.
Pumping system. No. 2,440,981. Marsden C. Smith (to Builders Iron Foundry).
Calibrating means for pitot venturi tubes. No. 2,441,042. Henry W. Stoll (to United States of America).
Pipe coupling. No. 2,441,055. George H. Babigian (to Roland B. Seferian).
Valve. No. 2,441,094. Sterling W Alderfer (½ to Edward D. Andrews).
Valve. No. 2,441,252. Emmett F. Sarver (to Rohlm Mfg. Co.)
Poppet valve. No. 2,441,253. Emmett F. Sarver (to Rohlm Mfg. Co.)
Rotameter and metering tube. No. 2,441,350. Kermit Fischer (to Fisher & Porter Company).
Vapor compression still with liquid level cutoff. No. 2,441,361. John Kirgan.
Apparatus for cataphoretically treating a liquid suspension. No. 2,441,479. Harmon F. Fisher (to Union Oil Company of California and The Permanente Metals Corp.).
Reactor for gas phase reactions. No. 2,441,528. Harry Bender, Robert Paul Obercht and Harold Edward Kling (to The Dow Chemical Company).
Continuous reading thermocouple temperature measuring device for rotary vessels. No. 2,441,562. Leon R. Chase and Royal H. Dimick.
Pressure controlling apparatus. No. 2,441,592. Win W. Paget (to Joy Manufacturing Co.).
Centrifugal dust separator. No. 2,441,631. Leslie W. Hills (to Hills Bros. Coffee Inc.).
Pump for corrosive fluids. No. 2,441,708. Enrique L. Luaces and Melvin A. Crosby (to Chemical Developments Corp.).
Two-piece hose coupling. No. 2,441,718. Arthur L. Parker and John N. Wolfram (to The Parker Appliance Co.).
Thermostatic switch. No. 2,441,725. Norman James Smith.
Pipe coupling. No. 2,441,754. Walter H. Cobi.
Pipe coupling. No. 2,442,034. Frank B. Busch.
Gravity indicator for fluids. No. 2,442,069. William H. Fortney (to Standard Oil Development Co.).
Rotary fluid pressure motor pump. No. 2,442,130. Edward Harry Johnson (to the Keelavite Co., Ltd.).
Self-priming centrifugal pump. No. 2,442,135. Charles I. Longenecker and Gilbert W. Quast (to Chain Belt Co.).
Reversible flow centrifugal pump. No. 2,442,512. Clarence William Rubison.
Glass magnetic stopcock. No. 2,442,599. Clifford E. Herrick, Jr. and Laurence C. Liberatore (to U. S. A. as represented by U. S. Atomic Energy Commission).
Packless valve. No. 2,442,625. Jesse B. Thomas (to U. S. A. as represented by the U. S. Atomic Energy Commission).
Process cycle controller. No. 2,442,835. Harold E. Allen (to The Bristol Co.).
Fluid control valve. No. 2,442,877. William A. Ray (to General Controls Co.).
Apparatus for fractionating a fluid mixture comprising: a fractionating column with packing in said column, occupying substantially the entire zone in which fractionation takes place and providing a free space area which increases progressively upward from substantially the bottom of the packing to substantially the top thereof. No. 2,443,072. Ralph R. Kaiser (to Joseph E. Seagram & Sons, Inc.).
Pump piston. No. 2,443,110. John W. MacClatchie.
A fluid seal pipe coupling comprising a body having an opening and a rigid projection having a substantially cylindrical surface surrounding said opening. No. 2,443,187. James C. Hobbs.
Magnetron filament temperature regulator. No. 2,443,189. Kenneth D. Jenkins.
Explosion resistant filter. No. 2,443,238. Clarence J. Glanzer (to Air Maize Corp.).
Jet ejector furnace. No. 2,443,244. Frederic O. Hess (to Selas Corp. of Amer.).
Pressure operated rheostat. No. 2,443,252. Frederick G. Kelly (to Thomas A. Edison, Inc.).
Burner for combustible gases. No. 2,443,259. John R. Martin (to Standard Oil Development Co.).
Fluid flow control apparatus. No. 2,443,263. Harry A. Meyer (to American Blower Corp.).
Pipe repair clamp comprising a flexible band adapted to encircle a pipe. No. 2,443,271. Ben H. Russell.
Compressor unit. No. 2,443,286. Ralph B. Weston.
Fluid operable stroke controlling device for fluid pumps. No. 2,443,301. Ray S. Conabee (to H-P-M Development Corp.).
Press with auxiliary ejector circuit. No. 2,443,311. Walter Ernst, Johan A. Muller, and Victor S. Shaw (to H-P-M Development Corp.).
Pressure cylinder. No. 2,443,312. George M. Geiger and Harold A. Donnenwirth (to H-P-M Development Corp.).
Rotary valve actuating device. No. 2,443,333. Warren R. Tucker (to H-P-M Development Corp.).
Reciprocating compressor. No. 2,443,344. James F. Ekleberry.
Means for mixing air with products of combustion of furnaces. No. 2,443,346. Richard C. Fair (to Wheeling Furnace Corp.).
Electronic control circuits. No. 2,443,347. William J. Field (to Minneapolis-Honeywell Regulator Co.).
Apparatus for weighing and discharging dry materials. No. 2,443,350. Harry A. Gilbert and Ingvar L. Tolf and Josephus J. Thayer (to General Foods Corp.).
Time duration pulse telemetering system. No. 2,443,351. Walter H. Green (to Infilco Inc.).
Electronic sequence timer. No. 2,443,398. Joseph J. Neff (to Jack & Heintz Precision Industries Inc.).
Vaporizer. No. 2,443,417. John K. Duncan.
Liquid measuring device. No. 2,443,421. Emil E. Hageline (to Lathrop-Paulson Co.).
Apparatus for carrying out an endothermic catalytic hydrocarbon conversion. No. 2,443,423. Carl J. Helmers (to Phillips Petroleum Co.).
Infrared gas analyzer. No. 2,443,427. Ray E. Kidder and John W. Berry (to American Cyanamid Co.).
Mixing valve. No. 2,443,499. James Fraser (to Speakman Co.).
In adjusting means for a pump plunger for altering the stroke. No. 2,443,555. Albert Dunkin (to Petersen Showcase & Fixture Co.).

Canadian

Automatic sampler and liquid feeding device. No. 449,755. Charles W. Morse.
Method of analyzing, with thermal-conductivity cells, exhaust gas resulting from combustion of a hydro-carbon fuel with air. No. 449,220. Wladimir Michael Zaikowsky.
Removing dust from air or gas wherein the air or gas first impinges against vanes or baffles whereby heavier particles are deflected by the vanes and fall by gravity on one side, the air passing between the vanes to the other, then through a body of filtering material. No. 449,239. Thomas Claude Worth (to British Filters Ltd.).
A precision rotary pump to dissolve the bubbles of a viscous bubble-containing liquid and forward the same at a substantially constant rate. No. 449,255. Winfield Walter Heckert (to Canadian Industries, Ltd.).
A fractionating condensation pump. No. 449,335. Robert E. Cortright (to Distillation Products, Inc.).
Diaphragm pump. No. 449,340. James O. McMillan (to Edwards Co.).
Gear pump. No. 449,393. Geza Walter Müller (to Société Industriele Générale de Mécanique Appliquée).
Centrifugal separator. No. 449,453. Edward F. Small.
Heat exchange device. No. 449,522. Paul H. Schoepflin, Charles N. Deverall and Robert C. Stutz (to Niagara Blower Co.).
Electrical resistance element durable at high temperature and proof against chemical action, consisting of a sintered mass containing silicon carbide and a carbide, nitride, silicide or boride of chromium and a carbide nitride, silicide or boride of one or more of the metals beryllium, molybdenum, tungsten, titanium or vanadium and, if desired, a nitride silicide, boride or oxide of one or more of the metals manganese, iron, nickel or cobalt. No. 449,613. Axel Richard Wejnarth.
Electrical resistance element durable at high temperatures and proof against chemical action, consisting of a sintered mass, containing silicon carbide as main component, and, in a smaller quantity a carbide, nitride, silicide or boride of aluminum or zirkonium. No. 449,614. Axel Richard Wejnarth.
Reciprocating pump. No. 449,718. William John Turner (½ to Edward Lloyd Mortimer Francis).
Compensating device for rotary pumps. No. 449,759. John B. Parsons.
Condensation pump. No. 449,820. Merriam E. Johnson (to Distillation Products, Inc.).
Apparatus for continuously determining and adjusting the specific gravity of a suspension. No. 449,852. Klass Frederik Tromp (to N. V. Domaniale Mijn Maatschappij).
Filter. No. 449,880. Cecil Gordon Vokes and Edward Arthur Stokes (to Vokes Ltd.).
Heat exchanger. No. 449,884. George H. Young (to Westinghouse Electric Corp.).
Self-priming pump. No. 449,919. Richard D. Campbell (to Allis-Chalmers Mfg. Co.).
Dust collector. No. 449,976. Albert Marinus Fennis, Edward Doyle Powers and Edward B. Magee (to Frontier Engineering & Manufacturing Ltd.).
Pump. No. 450,002. Charles A. Erickson (to United Specialties Co. to F. L. Jacobs Co.).
Pump. No. 450,003. Charles A. Erickson (to United Specialties Co. to F. L. Jacobs Co.).
Pump in which cylinders are arranged in circular series with their cylinder axes parallel with the axis of the drive shaft. No. 450,019. Matthew W. Huber (to The New York Air Brake Co.).
Liquid temperature regulator for controlling the temperature of a liquid which circulates under pressure to and from the heat generating means. No. 450,039. Walter Hayward Geddes and Phillip William Schanke (to United Aircraft Products, Inc.).
Apparatus for the treatment of travelling materials with fluid media having a jet through which the treated materials issue. No. 450,044. William J. Elvin, Max A. Shaffer and Elmer R. Stahl (to Camille Dreyfus).

Heat exchange apparatus for fluids including a curved convex heat transfer surface and a strip of metal secured edgeon to the surface and a tube having applied to its outer surface at least one radial gill or fin. No. 450,068. Ralph Poole.
Constant flow pump. No. 450,097. Calvin A. Elwood (to Canadian Kodak Co., Ltd.).
A liquid level gauge. No. 450,127. Ralph M. Heintz (to Jack & Heintz Precision Industries, Inc.).
Rotary pump. No. 450,129. Edward Harry Johnson (to The Keelavite Co., Ltd.).
Waste heat boiler. No. 450,135. Roland Bardeen Bourne (to The Maxim Silencer Co.).
Dust remover and filter. No. 450,180. Cecil Gordon Vokes and Edward Arthur Stokes (to Vokes Ltd.).
Combined centrifugal fan and dust collector. No. 450,182. Roland L. Lincoln (to Westinghouse Electric Corp.).
Combined centrifugal fan and dust collector. No. 450,183. Roland L. Lincoln (to Westinghouse Electric Corp.).
Valve. No. 450,214. Frederick C. Fischer.
Combined centrifugal pump and motor unit. No. 450,223. Dudley Georges Jones.
Governing means for a fluid under pressure. No. 450,307. Richard Joseph Ifield (to Joseph Lucas Ltd.).
Ejector pump. No. 450,308. Martin B. MacNeille and Raymond W. Frank (to A. Y. McDonald Manufacturing Co.).
Expansion joint. No. 450,329. Joseph V. Marancik and David B. MacClymont (to Standard Oil Development Co.).
Fractionation process and apparatus in a tray-bubble cap type fractionating tower. No. 450,330. John W. Packie and Lester S. Gibbs (to Standard Oil Development Co.).
Apparatus for measuring density of thixotropic fluid. No. 450,332. William E. Barnes (to Sun Oil Co.).
Apparatus for measuring density of a thixotropic fluid. No. 450,333. William E. Barnes (to Sun Oil Co.).
Reactor for performing reactions in the presence of solid contact materials. No. 450,338. Percy Mather, Lev A. Mekler and Clarence G. Gerhold (to Universal Oil Products Co.).
Pump having a plurality of cylinders parallel to the axis. No. 450,357. Pierre Guillaume Joseph Marie Audemar (to Olaer Patent Cy and Compagnie Generale pour l'Equipement Aeronautique).

Explosives

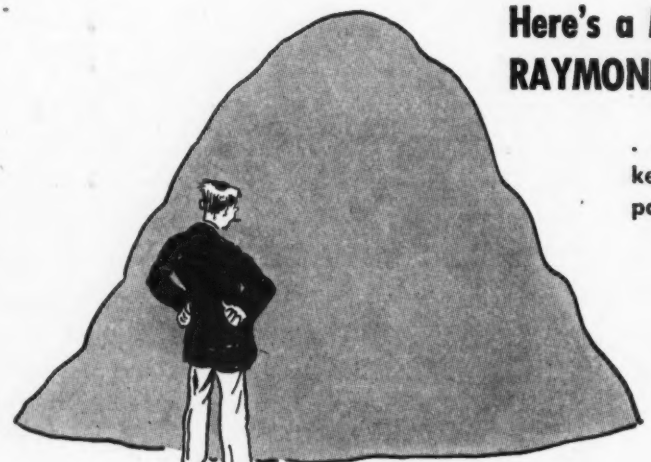
Propellent powder comprising nitrocellulose, nitroglycerin, dinitrotoluene, a stabilizer, and a coating of dinitrotoluene. No. 2,440,267. George C. Hale (to United States of America).
Thick section of double-base powder of the "hot" type, said powder being colored with a coloring matter capable of absorbing radiant energy. No. 2,440,327. Bryce L. Crawford, Jr. (to Regents of the University of Minnesota).

Food

Process for producing yeast by forming a coating of an active yeast wort on vegetable granules which contain nutrients. No. 2,440,545. George A. Jeffreys (to Nelson Littell).
Process for producing yeast- and vitamin-rich products which comprises forming air-pervious masses of vegetable particles coated with thin films of active yeast wort. No. 2,440,546. George A. Jeffreys (to Nelson Littell).
Treating a sugar-containing liquid with a mixture of the oxides of magnesium and calcium. No. 2,441,281. John J. Naugle and Leonard Wickenden (2/5ths to Andres Bay Trading Corporation and 2/5ths to Cuban Dominican Sales Corporation).
Treating an edible food glyceride oil to remove naturally-occurring, undesirable solutes. No. 2,441,923. Francis Michael Sullivan.
Purifying colored aqueous sugar syrup by extracting with a water soluble organic cyclic ether having two oxygen atoms per molecule. No. 2,442,804. Peter J. Gaylor.
Improved process for producing, from phosphate rock, an animal feed ingredient containing not less than about 30% of P_2O_5, and containing an amount of fluorine not more than 1/300 part of the P_2O_5 content. No. 2,442,969. Charles A. Butt (to International Minerals & Chemical Corp.).
Preservation of baked cereal food by adding bentonite. No. 2,443,138. Eugene G. Holden, Jr. (to American Colloid Co.).
Rendering animal fats. No. 2,443,274. Fred Schroeder.

Inorganic

Compound of a heavy metal selected from the group consisting of chromium and metals below iron in the E. M. F. series and the reaction product of a sulphite of phosphorus and an oxygen-containing wax. No. 2,439,819. John M. Musselman (to The Standard Oil Company).
Compounds of a heavy metal selected from the group consisting of chromium and metals below iron in the E. M. F. series and of a metal selected from the group consisting of barium and metals having not more than four electron orbits selected from groups I, II and III of the periodic system, and the reaction product of a sulphide of phosphorus and an oxygen-containing wax. No. 2,439,820. John M. Musselman (to The Standard Oil Company).
Revivifying a spent catalyst comprising a silicious body promoted with at least one oxide of a metal selected from the group consisting of tantalum, zirconium and columbium. No. 2,439,852. Donald R. Jackson (to Carbide and Carbon Chemicals Corporation).
Oxidation catalyst consisting of an intimate mixture of the trioxides of tungsten and molybdenum. No. 2,439,880. Herrick R. Arnold (to E. I. du Pont de Nemours & Company).
Process for manufacturing a catalyst which comprises commingling silica with decomposable salts of aluminum and zirconium and heating. No. 2,439,994. Charles L. Thomas and Edward C. Lee (to Universal Oil Products Company).
Treatment of iron sulfate liquors thereby separating therefrom a ferrous sulfate sludge. No. 2,440,215. Louis N. Allen, Jr. and Walter K. Zahray (to Chemical Construction Corp.)
Catalyst with a carrier of alumina which has been activated, magnesia, and a heavy metal oxide catalytic agent stabilized



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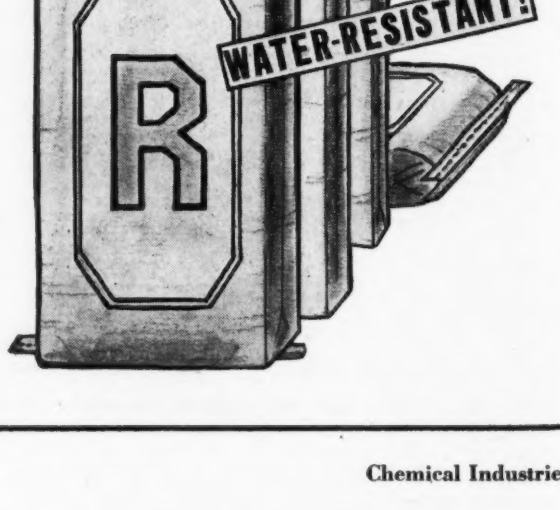

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by aluminum orthophosphate. No. 2,440,236. Robert I. Stirton (to Union Oil Company of California).

Increasing the resistance of red phosphorus to oxidation by adding a small amount of mannitol. No. 2,440,303. Martin S. Silverstein.

Removing dissolved sodium sulfate present in an aqueous sodium aluminate solution containing dissolved sodium organic salts. No. 2,440,378. James W. Newsome, Harold W. Heiser and James R. Wall (to Aluminum Company of America).

Polymerization catalyst in the form of a solution in an aliphatic solvent; of a double salt composed of a Friedel-Crafts active metal halide catalyst and a titanium alkoxy compound. No. 2,440,498. David W. Young and Henry B. Kellog (to Standard Oil Development Company).

Producing barium carbonate from barium sulphate. No. 2,440,641. Leonard John Minnick (to G. and W. H. Corson, Inc.).

Colorless ammonium thiocyanate. No. 2,440,717. William H. Hill and James H. F. Veltman (to Koppers Company).

Promoted acid treated clay catalyst. No. 2,440,743. Wright W. Gary (to Filtrol Corp.).

Polymerization catalysts consisting of aluminum alcoholate and aluminum chloride. No. 2,440,750. Charles A. Kraus and John D. Calfee (to Standard Oil Development Company).

Process for impregnating acid activated clay cracking catalyst particles with a catalyst promoter. No. 2,440,756. Thomas Dixon Oulton (to Filtrol Corp.).

Jewel material made from a mixture of the oxides of ammonium aluminum alum, boric acid, magnesium oxide, calcium sulphate, and litharge. No. 2,440,833. George S. Schaberle (to Bendix Aviation Corporation).

Drying alum. No. 2,441,022. Albert W. Kingsbury and William H. Osborn (to Phelps Dodge Corporation).

Producing a hydrocarbon conversion catalyst by reacting a polymeric di-alkyl siloxane, a compound of a metal selected from the group consisting of aluminum, magnesium and zirconium, and an aqueous solution of a base. No. 2,441,214. Charles L. Thomas and Curtis F. Gerald (to Universal Oil Products Company).

Preparing dibasic calcium hypochlorite crystals by mixing calcium hydroxide with an aqueous suspension containing dibasic calcium hypochlorite crystals, supplying to said suspension of dibasic calcium hypochlorite crystals and calcium hydroxide, hypochlorite ions capable of reacting with calcium hydroxide to form dibasic calcium hypochlorite. No. 2,441,337. Jerome W. Sprauer (to The Pennsylvania Salt Mfg. Co.).

Organosilicon-silica sols, gels, and aerogels. No. 2,441,422. Robert H. Krieble and John R Elliott (to General Electric Company).

Producing chlorine and sodium sulfate by converting sulfur dioxide to sulfur trioxide contacting the sulfur trioxide with sodium chloride so that a substantial amount of sodium chlorosulfonate is formed; thermally decomposing the sodium chlorosulfonate to form gaseous chlorine, and sulfur dioxide, and solid sodium sulfate. No. 2,441,550. Arthur W. Hixson and Ralph Miller (to The Chemical Foundation, Inc.).

Treatment of magnesium fluoride to render the same suitable as a lens coating material by melting, holding under reducing conditions for from five minutes to one hour at atmospheric pressure to remove volatile substances. No. 2,441,668. Frank C. Mathers and Paul S. Visher.

A new composition of matter adapted to adsorb straight chain hydrocarbons consisting of a solid adsorptive material having the empirical formula based on the oxides $4CaO.Al_2O_3.4SiO_2$ prepared by reacting a hydrous oxide of aluminum, a hydrous oxide of silicon and calcium hydroxide and dehydrating. No. 2,442,191. James F. Black (to Standard Oil Development Co.).

Process for the manufacture of spheroidal pellets of inorganic oxide hydrogel. No. 2,442,387. Peter D. Valas (to Socony-Vacuum Oil Co.).

Recovery of a magnesium compound from a hydrous slurry containing both calcium and magnesium hydroxides by reacting the slurry with magnesium bicarbonate to convert the calcium hydroxide to calcium carbonate, subjecting the resulting slurry to carbonation so as to produce solid phase carbonate, subjecting the carbonated slurry to separating treatment whereby neutral magnesium carbonate is removed in an underflow and the calcium carbonate with the remainder of the neutral magnesium carbonate in an overflow. No. 2,442,481. Edgar B. Baker (to Marine Magnesium Products Corp.).

Apparatus for seasoning and granulating acidulated phosphate. No. 2,442,513. Walter J. Sackett (to A. J. Sackett & Sons Co.).

Manufacture of magnesium chloride. No. 2,442,525. Edgar E. Wrege and William A. Cunningham (to International Minerals & Chemical Corp.).

Hydrolizing vanadate solutions by bringing a solution containing alkali metal vanadate in contact with a solution of a neutralizing acid. No. 2,442,610. Walter F. Meister (to National Lead Co.).

Manufacture of sodium sulfate and chlorine by reacting sodium pyrosulfate and sodium chloride to produce sodium sulfate and a mixture of sulfur dioxide and chlorine, adding sulfur dioxide and an oxygen-containing gas and passing said admixture through a catalytic sulfuric acid contact converter, whereby a mixture of sulfur trioxide and chlorine is obtained, and passing the mixture of sulfur trioxide and chlorine through a melt of preformed sodium pyrosulfate while adding sodium sulfate obtained in step A, whereby the sodium pyrosulfate required for Step A is formed and a chlorine-containing gas is recovered. No. 2,442,874. Jonas Kamlet.

Making crystalline anhydrous alkali metal orthosilicate by reacting a member of the group consisting of silica and the soluble silicates whose ratio of $ME_2O:SiO_2$ is less than that of the orthosilicate in a body of molten caustic alkali in contact with iron. No. 2,443,128. Brazier K. Beecher (to Wyandotte Chemicals Corp.).

Removal of metal halide from fluids. No. 2,443,141. John W. Latchum, Jr. (to Phillips Petroleum Co.).

Purifying lithium hypochlorite with tertiary butyl alcohol. No. 2,443,168. Homer Louis Robson (to Mathieson Chemical Corp.).

Producing zirconium chloride by reacting solid ferrous chloride and solid zirconium-silicon alloy. No. 2,443,253. William J. Kroll and Frederick E. Bacon (to Electro Metallurgical Co.).

Separation of columbium and tantalum oxides by subjecting said material to the action of hydrogen to reduce columbium oxide selectively; subjecting said reduced columbium oxide to the action of gaseous chlorine, and distilling and condensing. No. 2,443,254. William J. Kroll and Frederick E. Bacon (to Electro Metallurgical Co.).

Hydrogen peroxide by the partial oxidation of hydro-aromatic hydrocarbons. No. 2,443,503. Charles R. Harris (to E. I. DuPont de Nemours & Co.).

Canadian

Process for precipitating cobalt as a hydroxide by addition of nickelic hydroxide to produce a precipitate. No. 449,508. Albert Edward Wallis and DeWitt Henry West (to The International Nickel Co. of Canada, Ltd.).

Recovering fluosulphonic acid from spent fluosulphonic acid formed in the manufacture of DDT which comprises admixing spent fluosulphonic acid containing free sulphur trioxide with said spent acid, distilling the resulting mixture and recovering fluosulphonic acid as the distillate. No. 449,650. Charles William Gates and William Pearson Woods (to Dominion Rubber Co., Ltd.).

Recovering fluosulfonic acid from spent fluosulfonic acid which has been formed in the manufacture of DDT which comprises admixing sulphur trioxide with the spent acid, distilling the resulting mixture and recovering fluosulfonic acid as the distillate No. 449,651. Marshall Kulka (to Dominion Rubber Co., Ltd.).

Production of concentrated lyes by decomposition of the alkaline amalgams. No. 449,687. Alexis Basilewsky (to Solvay & Cie).

Process for the **production alkaline chlorites** by action of HCl on an alkaline chlorate. No. 449,688. Pierre Rossier (to Solvay & Cie).

Removing nickel from impure cobaltic hydroxide which comprises digesting cobaltic hydroxide in an acid liquor having a pH value between 0.9 and 2.0. No. 449,844. Albert Edward Wallis and De Witt Henry West (to The International Nickel Co. of Canada, Ltd.).

Waterproofing bodies made of colloidal crystalline inorganic hydrous oxides which contain structural water and are capable of swelling when in contact with water to form plastic hydrogels and have basic exchange properties and the individual crystallites of which exhibit at least one surface plane in the form of a silica sheet having hexagonal voids with a diameter of the inscribed circle of about 2.6 Angstrom units which comprises contacting such a body with a solution of a salt the cation of which has an ionic diameter of at least about 2.6 Angstrom units and the anion of which contains an unsaturated carbon to carbon linkage and is capable of polymerization to water-insoluble hydrophobic product. No. 449,866. Ernst A. Hauser (to Research Corp.).

Preparing a ferricyanide in aqueous solution by oxidizing a ferrocyanide in an alkaline medium while heating the solution by flowing steam subsequently cooling and removing water by vacuum evaporation. No. 450,077. George H. Foster and Louis L. Lento, Jr. (to American Cyanamid Co.).

Preparation of a suspension of finely-divided, solid potassium hydroxide by heating a mixture of potassium hydroxide, water, and water-immiscible liquid. No. 450,100. Glen H. Morey and Everet F. Smith (to Commercial Solvents Corp.).

Medicinal

Steroidal compounds. No. 23,008. Romeo B. Wagner (to Parke, Davis & Co.).

Therapeutic solution comprising riboflavin veratryl alcohol and water. No. 2,440,050. Albert Ensign Knauf and Frederick Joseph Kirchmeyer (to Abbott Laboratories).

Manufacture of Δ1-steroid-ketones-3 comprising heating 2-halogeno steroid ketone-3 with a higher boiling pyridine base said base being a member of the group consisting of collidine and 2,4-dimethyl pyridine, and recovering the Δ1-steroid ketone-3. No. 2,441,560. Adolf Butenandt (to Schering Corp.).

Oxygen analog of biotin and process of making same. No. 2,441,934. Robert Duschinsky (to Hoffman-La Roche, Inc.).

Synthesizing pantothenic acid by coupling alpha-hydroxy-beta, beta-dimethylbutyrolactone with beta-alanine. No. 2,441,949. Sidney H. Babcock Jr. (to the Regents of the University of California).

Preparing the dry alkali metal salt of ascorbic acid by dissolving the acid in water, adding an alkali metal bicarbonate, adding a substantially anhydrous aliphatic alcohol containing not more than five carbon atoms in the aliphatic radical, filtering, and drying. No. 2,442,005. William A. Holland.

Producing an antibiotic substance comprising extracting honey-bee larvae, dead of American foulbrood and dried down, with water, and recovering the antibiotic substance from the extract. No. 2,442,006. Eugene C. Holst (to People of the United States).

A method of hydrolyzing proteins to obtain amino acids including tryptophane, by heating a proteinaceous material with an aqueous solution of sulfurous acid. No. 2,442,055. Anthony M. Moos (to American Cyanamid Co.).

A method for producing penicillin incubating a penicillin-producing mold in contact with an aqueous nutrient medium containing an assimilable carbon source and containing from degraded proteinaceous material, a portion of the assimilable carbon source being added at the beginning of the incubation period and additional increments being added during the period to compensate for that used up by the mold. No. 2,442,141. Andrew J. Moyer (to U. S. A. represented by Secretary of Agriculture).

In the process of synthesizing a normal salt of pantothenic acid, the step which comprises condensing a polyvalent metal salt of β-alanine with α-hydroxy β,β dimethyl butyrolactone in the presence of a substantially anhydrous alcohol containing 1 to 3 carbon atoms. No. 2,442,143. Frank D. Pickel and Harry H. Weinstock (to Nopco Chemical Co.).

Stable aqueous solution of calcium ascorbate containing an aliphatic thiocarboxylic acid as a stabilizing agent. No. 2,442,461. Walter Karrer (to Hoffmann-La Roche Inc.).

Production of a chemo-therapeutic by reacting a 2-sulphanilamido-1,3,4-thiodiazole, having in the 5-position, a radical of the group consisting of hydrogen, alkyl and aryl with a compound selected from the group consisting of ammonia and aliphatic amines. No. 2,442,602. Oluf Hubner (to H. Lundbeck & Co.).

Purifying vitamin B_6 by reacting impure vitamin B_6 with boric acid to produce a vitamin B_6-borate complex. No. 2,442,677. Malcolm L. Brown (to Merck & Co., Inc.).

As new therapeutic agents, p-amino benzoic acid esters of secondary alkylamino propanols, in which the secondary alkyl

group has from 5 to 9 carbon atoms. No. 2,442,721. Arthur C. Cope (to Sharp & Dohme, Inc.).

As new therapeutic agents p-amino benzoic acid **esters of alicyclic** amino alcohols of the formula HOR_1NHR in which R is a hydrocarbon alicyclic group having from 5 to 10 carbon atoms, the ring structure of which has from 5 to 6 carbon atoms and R_1 is an alkylene group having from 3 to 4 carbon atoms. No. 2,442,797. Arthur C. Cope (to Sharp & Dohme).

Preparation of methionine by hydrolyzing methionine nitrile with hot dilute sulfuric acid. No. 2,443,391. Edward C. Kirkpatrick (to E. I. DuPont de Nemours & Co.).

Synthesis of compounds of the ascorbic acid series by subjecting keto-acid esters to the action of a secondary amine. No. 2,443,487. Wilhelm Wenner (to Hoffmann-La Roche Inc.).

Manufacture of ascorbic acid by converting salts present in an aqueous solution containing ascorbate ions to the free acids by contacting with a cation exchange material. No. 2,443,583. Hugh H. Mottern and Robert E. Buck.

Canadian

Making solid mono-calcium citrate dihydrate which comprises incorporating calcium reagent selected from the group consisting of calcium oxide, calcium hydroxide and calcium carbonate, and anhydrous citric acid or hydrated citric acid. No. 449,675. Richard S. Nicholls (to Miles Laboratories, Inc.).

Metals, Ores

Electrowinning manganese from an electrolyte of manganese and ammonium sulphate. No. 2,439,805. Herbert R. Hanley and James H. Jacobs.

Process for electrodepositing indium by electrolyzing an aqueous solution of perchloric acid. No. 2,439,935. Thomas R. Jones and Nevin R. Bierly (to The American Metal Company, Limited).

Electrolytic cell for producing metallic mercury. No. 2,440,238. Harold R. Alley and Benjamin F. Freeberg.

Purifying metallic mercury. No. 2,440,456. Harold R. Alley and Benjamin F. Freeberg.

Recovering the copper content and the nickel content from ammoniacal ammonium carbonate leaching solutions by reducing until the copper is reduced to the cuprous state, converting the cuprous ammonium carbonate formed into a copper acetylide precipitate, and separating said precipitate. No. 2,440,-612. Myrl Lichtenwalter (to Nicaro Nickel Company).

Silver-cyanide plating bath. No. 2,440,672. Harry J. Green (to General Motors Corp.).

Electrolytically polishing nickel and nickel alloys. No. 2,440,-715. Charles L. Faust and Paul D. Miller (to Battelle Development Corporation).

An alloy of nickel chromium, copper and silver. No. 2,441,126. Jacob Kurtz (to Callite Tungsten Corp.).

Removing iron from a molten tin metal containing iron. No. 2,441,768. James Fernando Jordan.

Making iron powder by treating substantially anhydrous ferrous chloride with ammonia to form and sublime ammonium chloride to form iron nitride; heating said nitride in an atphosphere of hydrogen to form iron powder and ammonia. No. 2,441,770. William J. Kroll.

In the process of recovering aluminum values from wastes composed of mixtures of metallic aluminum and aluminum oxide which comprises forming a mixture of said wastes and alkali metal carbonate and heating to promote formation of alkali metal aluminate the improvement consisting in mixing with said mixture, prior to heating the same, an aqueous solution of alkali metal hydroxide. No. 2,442,137. Lawrence S. Lynn, Jr. and Edwin L. Shirley (to Aluminum Co. of America).

Process of cleaning and copper plating the surface of a ferrous metal article which comprises immersing said article in a fused caustic soda bath and passing a direct current through said bath and article to subject the article to the following series of electrolytic operations: (a) as the anode to remove organic matter from the surface; (b) as the cathode until adherent rust and scale are removed; (c) as the anode to remove spongy copper deposited during step b; and (d) as the cathode to deposit on the surface of said article a homogeneous coating of copper. No. 2,442,195. James T. Clenny (to General Electric Co.).

High temperature alloy containing carbon, chromium, nickel, a metal from the group consisting of tungsten and molybdenum, silicon, manganese, beryllium with the balance substantially all iron. No. 2,442,209. Lee E. Osman (to General Electric Co.).

Treating ores containing uranium, vanadium and radium with a solution of an alkali carbonate, treating the washed solution and its fines and slimes with an acid sulphate, adding a solution of a metallic salt to precipitate an insoluble sulphate to take suspended fines and slimes out of solution, treating the supernatant solution with a caustic alkali base to precipitate concentrates of uranium, radium and vanadium compounds and produce a basic alkali solution. No. 2,442,429. Ralph D. Nye and Dana J. Demorest.

In separating ores containing a plurality of constituents by modifying surface conditions on at least one of the constituents, the improvement in beneficiating ores of a mineral selected from the group consisting of barite, calcite, delestite, dolomite, phosphate rock, gypsum, magnesite, scheelite, and talc which comprises treating the ore with an effective amount of a material selected from the group consisting of the water-soluble, sulfonated petroleum hydrocarbons of the green acid type. No. 2,442,455. Robert Ben Booth and Joseph Emmett Carpenter (to American Cyanamid Co.).

Electro-polishing stainless steel by immersing in a bath containing aqueous nitric acid and water. No. 2,442,592. Alexander L. Feild (to The American Rolling Mill Co.).

Recovery of nickel from idle nickel electroplating baths and the production of an iron-nickel master alloy. No. 2,442,628-9. Andrew Wesley and Edward Judson Roehl (to The International Nickel Co., Inc.).

Deleading zinc-lead fume. No. 2,442,674. Carlos Bardwell (to International Smelting & Refining Co.).

Process for cleaning metals and metal articles by immersing metals other than zinc and zinc alloys in a fused bath containing alkali metal cyanide and alkali metal hydroxide. No. 2,442,802. Norman L. Evans (to Imperial Chemical Industries).

Protecting the surface of molten zinc in the galvanizing of metal, by adding a dry mix of ammonium chloride, zinc oxide, and alkali metal chloride and zinc chloride, which mix forms a liquid fusion blanket on the surface of the molten zinc. No. 2,443,169. Dunbar L. Shanklin (to Dewey and Almy Chemical Co.).

Canadian

Electroplating bath for depositing a bright silvery alloy plate composed of copper, tin and zinc. No. 449,315. George W. Jernstedt (Canadian Westinghouse Co., Ltd.).

Apparatus for the production of metallic magnesium by thermal reduction of magnesia. No. 449,336. MacNeil Edward Hertel (to Dominion Magnesium Ltd.).

Production of oxygen-free copper. No. 449,358. Arthur L. Christensen and Horace F. Silliman (to International Smelting and Refining Co.).

Temperature responsive device. No. 449,384. Samuel George Eskin (to Robertshaw-Fulton Controls Co.).

Method of recovering and utilizing tin by fusing with caustic alkali to form a stannate, separating the soluble tin values, precipitating and separating the tin values from the stannate solution, reacting the precipitate with aqueous caustic alkali to produce an alkali metal stannate, and electrolyzing said solution. No. 449,504. Louis Weisberg (to Hanson-Van Winkle-Munning Co.).

Iron alloy comprising chromium, molybdenum, carbon and nickel, and the remainder iron. No. 449,702. Martin Fleischmann (to The Timken Roller Bearing Co.).

Electrical precipitation apparatus. No. 449,715. Harry J. White (to Western Precipitation Corp.).

Primary cell comprising a metallic cathode, an inattackable anode and an oxygenated depolarizer forming a weakly acid solution of oxygen-yielding substances. No. 449,766. Alfred Schmid.

Nuclear Processes

Compressed neutron source. No. 2,440,999. Herbert L. Anderson (to United States of America).

Carrier for radioactive material. No. 2,442,617. Solomon Rosenblum (to Canadian Radium & Uranium Corp.).

Organic

Fermenting carbohydrates to butanol and acetone with clostridium saccharo acetoperbutylicum. No. 2,439,791. Samuel C. Beesch (to Publicker Industries Inc.).

4-(4-n-butylsulfamyl-2-nitrophenylazo)-3-carbethoxy-5-pyrazolone. No. 2,439,798. Joseph B. Dickey and John R. Byers, Jr. and James G. McNally (to Eastman Kodak Company).

Azo benzene benzthiazyls. No. 2,439,804. Norman Hulton Haddock (to Imperial Chemical Industries Limited).

Securing a plurality of rosin fractions from resins from a solution of rosins dissolved in liquified, normally gaseous paraffin hydrocarbons. No. 2,439,807. Arthur W. Hixson and Ralph Miller (to The Chemical Foundation, Incorporated).

The sulfuric acid reaction product of 2-mercapto-4,6,6-trimethylthiazine, and the metal salts of said reaction product. No. 2,439,810. Jacob Eden Jansen (to The B. F. Goodrich Company).

Making phenol from benzene vapor and oxygen-containing gas under a pressure in excess of about 500 pounds per square inch at a temperature between about 600° F. and about 950° F. No. 2,439,812. Robert H. Krieble and William I. Denton (to Socony-Vacuum Oil Company).

Preparing the dimer of 2-mercapto-4,6,6-trimethylthiazine by heating a thiazine selected from the class consisting of 2-mercapto-4,6,6-trimethylthiazine and 2-mercapto-4-hydroxy-4,6,6-trimethyldihydrothiazine in the presence of an aqueous solution of a dehydrating mineral acid. No. 2,439,828. Frank Swedish, Jr. (to The B. F. Goodrich Company).

Manufacture of carbon black. No. 2,439,850. George L. Heller (to Columbian Carbon Company).

Process for separating dimethyl propylene glycol from racemic α-hydroxy-β,β-dimethyl-γ-butyrolactone. No. 2,439,905. Frank D. Pickel and Louis T. Rosenberg (to Nopco Chemical Co.).

Process for the production of bis-(3-chlorotetrahydropyran)-2-ether which comprises mixing 2-hydroxy-3-chloroterahydropyran with 3-chloro-5,6-dihydropyran, saturating the resulting mixture with hydrogen chloride, and isolating the resulting bis-3-chlorotetrahydropyran)-2-ether. No. 2,439,928. Peter A. Hawkins and Nicholas Bennett (to Imperial Chemical Industries Limited).

Treatment of seaweed for the production of agar. No. 2,439,-964. Joseph Francis Byrne and Philip Steward Powling.

Amino-dioxacyclopentanes. No. 2,439,969. Ernest Fourneau (to Societe des Usines Chimiques Rhone-Poulenc).

Dehydrating castor oil by contacting castor oil at a dehydrating temperature and superatmospheric pressure with an aqueous solution containing at least 1 weight percent but less than 5 percent of an acidic substance selected from the group consisting of the mineral acids and hydrolyzable salts of mineral acids. No. 2,439,982. George S. Monroe and Vladimir N. Ipatieff (to Universal Oil Products Company).

Alkylation of xylenol by reacting 3,5-xylenol with a saturated aliphatic primary amine. No. 2,440,036. De Loss E. Winkler and Seaver A. Ballard (to Shell Development Company).

Cyclohexyl alpha-ethoxy acrylate. No. 2,440,092. Mark Hyman, Jr. and Paul H. Johnson, Jr., (to Polaroid Corporation).

A water dispersible product formed by the reaction of an alkylene oxide with a mixture of unsaturated and hydroxy terpenes in the presence of an alkaline catalyst. No. 2,440,093. William O. Israel (to Industrial Rayon Corporation).

2-mercapto thiazines and method of preparing. No. 2,440,095. Jacob Eden Jansen (to The B. F. Goodrich Company).

Tris-(trimethylsilyl) borate. No. 2,440,101. Robert Henry Kreible (to General Electric Company).

Catalytic hydrogenation of carbon monoxide to produce compounds containing at least 2 carbon atoms per molecule by suspending the catalyst in finely-divided form in carrier liquid substantially non-vaporizable. No. 2,440,109. Frank J. Moore (to The Texas Company).

Process for preparing a monosulfonamide of a primary organic aromatic amine, which consists of chlorsulfonation of a primary organic aromatic amine with chlorsulfonic acid thereafter aminating with ammonia. No. 2,440,117. Alexander H. Popkin (to Sun Chemical Corporation).

Manufacture of ketotetrahydropyridine derivatives and hydroxypyridine derivatives. No. 2,440,218. Franz Bergel and Aaron Cohen (to Hoffmann-La Roche Inc.).

Manufacture of ketotetrahydropyridine derivatives and hydroxypyridine derivatives. No. 2,440,219. Franz Bergel and Aaron Cohen (to Hoffmann-La Roche Inc.).

Cyclic ether. No. 2,440,220. Herman A. Bruson and Thomas W. Riener (to The Resinous Products & Chemical Company).

Preparation of xanthopterin from 5-dichloroacetamino-2,4-diamino-6-hydroxypyrimidine. No. 2,440,221. George H. Hitchings (to Burroughs Wellcome & Co.).

Producing α-aceto-α-chloro-γ-butyrolactone which comprises reacting α-aceto-γ-butyrolactone with chlorine gas in the presence of water and an alkaline earth metal carbonate. No. 2,440,229. Robert Zumbrunn (to Hoffman-La Roche Inc.).

Method of making phenol by reacting benzene and oxygen-containing gas under a pressure in excess of about 500 pounds per square inch at a temperature between about 650° F. and about 1000° F. incorporating in the reaction mixture a minor proportion of an organic compound selected from the group consisting of those consisting of carbon and hydrogen and those consisting of carbon, hydrogen, and oxygen. No. 2,440,233. Robert H. Krieble and William I. Denton (to Socony-Vacuum Oil Company, Incorporated).

Method of making phenol from a mixture of benzene vapor and oxygen-containing gas under pressure at an elevated temperature; the step of incorporating in said reaction mixture an ether selected from the group consisting of diethyl ether, beta, beta' -dichloro diethyl ether, and dioxane No. 2,440,234. Robert H. Krieble and William I. Denton (to Socony-Vacuum Oil Company, Inc.).

Preparing a condensation product of rosin comprises incorporation of an organic acid selected from the class consisting of oxalic acid, citric acid, salicylic acid, tartaric acid and benzoic acid, and heating. No. 2,440,242. Laszlo Auer.

Treating coal tar containing a small amount of ammonium chloride for its removal. No. 2,440,311. William Tiddy (to Allied Chemical & Dye Corporation).

Preparing an alkylolamide of a trihydroxystearic acid from trihydroxystearic acid and an alkylol amine in the presence of an aromatic hydrocarbon. No. 2,440,349. Benjamin B. Schaeffer (to the United States of America).

Antioxidant composition comprising phospholipids and an ascorbyl monoester of a saturated aliphatic monocarboxylic acid containing 12 to 18 carbon atoms per molecule. No. 2,440,383. Roy W. Riemenschneider and Jack Tuner (to The United States of America).

Manufacture of cyclohexane by (1) reacting a hydrocarbon stream containing benzene and methylcyclopentane with hydrogen to convert a major portion of said benzene to cyclohexane, (2) fractionating the product stream to obtain an azeotrope of methylcyclopentane with benzene and a substantially benzene-free stream containing cyclohexane. No. 2,440,414. Alex G. Oblad (to Socony-Vacuum Oil Company).

Metallating an α-cyano ester, $R.CH(CN).CO_2X$, where R is selected from the group consisting of hydrogen, aromatic hydrocarbon radicals, and saturated aliphatic hydrocarbon radicals, and X is an alkyl radical. No. 2,440,421. Vernon H. Wallingford and August H. Homeyer (to Mallinckrodt Chemical Works).

Apparatus for manufacture of carbon black. No. 2,440,423. William B. Wiegand and Harold A. Braendle (to Columbian Carbon Company).

Manufacture of carbon black. No. 2,440,424. William B. Wiegand and Harold A. Braendle (to Columbian Carbon Co.).

Inhibiting the polymerization of furfural by incorporating therein quinoline or its alkyl homologs. No. 2,440,442. John C. Hillyer and Daniel A. Nicewander (to Phillips Petroleum Company).

Inhibiting the polymerization of furfural with minor proportions of an inorganic thiocyanate and a compound selected from the group consisting of pyridine and its alkyl homologs. No. 2,440,451. Walter A. Schulze and John C. Hillyer (to Phillips Petroleum Company).

Producing butadiene and pentadiene from pentenes when contacted with an active dehydrogenation catalyst selected from the class consisting of manganese oxide, chromium oxide, iron oxide, cobalt oxide and nickel oxide associated with a base from the class consisting of magnesium oxide, zinc oxide, and barium oxide, together with an alkaline metal compound having basic properties and a stabilizing oxide between 1100 and 1400° F. No. 2,440,471. Walter R. F. Guyer (to Standard Oil Development Company).

Production of butadiene from a hydrocarbon mixture including butylene and pentylene. No. 2,440,492. Wilson D. Seyfried and Sam H. Hastings (to Standard Oil Development Company).

Reacting a monoalkylol amine, an amino acid and a dicarboxylic acid. No. 2,440,516. Edward L. Kropa (to American Cyanamid Company).

Production of a dichlorophenol by chlorinating molten phenol. No. 2,440,602. Reginald Thomas Foster and Nicholas Bennett (to Imperial Chemical Industries Limited).

Reacting an ethyl alcohol solution of a **halogenated quinazoline and N-p-aminobenzoyl glutamic acid.** No. 2,440,649. Souren Avakian and Gustav J. Martin (to The National Drug Company).

Salicyloyl beta alanide. No. 2,440,658. Harold Urist and Gustav J. Martin (to The National Drug Company).

Cyanothiophanes. No. 2,440,659. Bernard R. Baker (to American Cyanamid Company).

Hydrogenolysis of steroid thioacetals. No. 2,440,660. Seymour Bernstein and Louis Dorfman (to American Cyanamid Company).

Granulated, gelled and water-insolubilized products of reaction of a mixture, including **formaldehyde and sodium 1-(o-hydroxyphenyl)-3-ketobutane sulfonate.** No. 2,440,669. Jack T. Thurston (to American Cyanamid Company).

Hydrogenation of butadienesulfones to thiophenes. No. 2,440,671. James H. Boyd, Jr. (to Phillips Petroleum Company).

Production of alkyl-substituted ethanes. No. 2,440,678. Thomas Aven Ford and Henning Waldemar Jacobson (to E. I. du Pont de Nemours & Company).

Separating refined anthracene from crude anthracene by linkage with the maleic radical. No. 2,440,688. Thomas Harold Insinger, Jr. (to Koppers Company, Inc.).

N,N-dimethyl-N'-benzyl-N'-(2-thiazolyl)-ethylene-diamines. No. 2,440,703. Clarence W. Sondern and Philip J. Breivogel (to White Laboratories, Inc.).

Refining of naphthalene by distillation. No. 2,440,707. Bernard J. C. van der Hoeven (to Koppers Company, Inc.).

A d-chondocurarine halide having the empirical formula $C_{38}H_4O_6N_2$ (halogen)$_2$, being the dimethohalide of d-chondocurine, a tertiary base obtained from **Chondodendron tomentosum.** No. 2,440,708. Oskar Wintersteiner, and James D. Dutcher (to E. R. Squibb & Sons).

N-substituted 2-butene-1,4-diamines. No. 2,440,724. Glen H. Morey (to Commercial Solvents Corporation).

Heavy metal salt of a polyhydroxyalkanemonothiol. No. 2,440,729. Frank Kerr Signaigo (to E. I. du Pont de Nemours & Co.).

Manufacturing hexachlorethane by bringing together perchlorethylene and liquid chlorine. No. 2,440,731. William H. Vining and Oliver W. Cass (to E. I. du Pont de Nemours & Company).

Storing or preserving an aqueous solution of formaldehyde by cooling to a temperature below room temperature to form a gelled or pasty mass. No. 2,440,732. Edward S. Yates (to E. I. du Pont de Nemours & Company).

Production of 1-amino-2-sulfo-4-brom-anthraquinone by brominating 1-amino-2-sulfo-anthraquinone. No. 2,440,760. George W. Seymour, Victor S. Salvin and Walter R. Edwards (to Celanese Corporation of America).

Producing tetrachloroethylene from methylene chloride from the latter and chlorine. No. 2,440,768. John W. Churchill (to The Mathieson Alkali Works, Inc.).

Purifying steam distilled tetra ethyl lead which comprises agitating the tetra ethyl lead with a weak aqueous solution of an oxidizing agent of the class consisting of the alkali metal dichromates and the alkaline earth metal dichromates. No. 2,440,810. Alfred Edwin Parmelee (to E. I. du Pont de Nemours & Company).

Polymeric phenolic condensation products prepared of a phenol with 2,6-dimethylol-4-tt-octylphenol. No. 2,440,909. Joseph B. Niederl.

Production of 1,5-pentanedial which comprises reacting 2,3-dihydropyran with water and hydrogen in the presence of a copper containing hydrogenating catalyst. No. 2,440,929. John George Mackay Bremner and Frederick Starkey (to Imperial Chemical Industries Limited).

Manufacturing of trans-1,2-dichlorethylene, consisting in passing acetylene through a hydrochloric acid solution of cupric chloride in the presence of mercuric chloride. No. 2,440,997. Erich Adler (to Stockholms Superfosfot Fabriks Aktiebolag).

Light-polarizing suspension of oriented crystals of dibenzacridine periodide in cellulose acetate. No. 2,441,019. Vlasios Georgian, William F. Amon, Jr., Ralph Gofstein, Edwin H. Land, Cutler D. West and Robert B. Woodward (to Polaroid Corporation).

Acyl thiocarbamo sulfenamides. No. 2,441,032. Philip T. Paul (to United States Rubber Company).

Process for removing N-methylol groups from an N-alkoxymethyl polycarbonamide. No. 2,441,057. Theodore Le Sueur Cairns (to E. I. du Pont de Nemours & Company).

A salt of an alkylolamine boric ester and an organic acid having from 8 to 22 carbon atoms selected from the group consisting of aliphatic, alicyclic and aromatic acids. No. 2,441,063. Henry H. Gilman (to Quaker Chemical Products Corporation).

2-amino-methyl-indenes and their production. No. 2,441,069. Karl Hoffmann and Henri Schellenberg and Karl Miescher (to Ciba Pharmaceutical Products Incorporated).

Preparation of a 7-dehydrosterol, which comprises subjecting a 7-halogenosterol to the action of a dehydrohalogenating agent. No. 2,441,091. Jacob van der Vliet and William Stevens (to Hartford National Bank and Trust Company).

Conversion of alkyl aromatic hydrocarbons into alkenyl aromatic hydrocarbons. No. 2,441,095. Harry A. Cheney and Summer H. McAllister (to Shell Development Company).

Hydrolyzing an organic nitrile by reacting an organic nitrile with water in the presence of hydrogen chloride in an ether. No. 2,441,114 Vernon K. Krieble and Robert H. Smellie.

Making activated carbon from the calcium compounds of waste sulfite liquor. No. 2,441,125. Ernst Berl.

A p-amino-benzene-sulfonamide bile acyl in which the bile acyl radical is present in the N^1 position of the sulfanilamide group. No. 2,441,129. Arpad Berczeller.

Amino acrylates. No. 2,441,130. Herbert I. Bernstein and Donald Long (to Quaker Chemical Products Corp.).

An optically active basic amino acid salt of a stereoisomer of **cis-2-(4'-carboxy-butyl)-3:4-ureido-tetrahydrothiophene.** No. 2,441,141. Karl Folkers and Donald E. Wolf (to Merck & Co.).

Hexahydrobenzyl-Δ^3-tetrahydrobenzoate. No. 2,441,183. Joseph E. Bludworth and Donald P. Easter (to Celanese Corporation of America).

Treating tall oil by heating in the presence of phosphorous acids, oxides, sulfides, chlorides, and oxychlorides. No. 2,441,197. Nicholas L. Kalman (to Ridbro Laboratories, Inc.).

Separating constituents of tall oil by treating with phosphorus pentoxide and ortho-phosphoric acid. No. 2,441,198. Vigen K. Babayan (to Ridbo Laboratories, Inc.).

Rendering a readily oxidizable abietyl compound resistant to oxidation by an ingredient selected from the class consisting of disproportionated abietyl compounds and hydrogenated abietyl compounds. No. 2,441,231. Seymour Yolles (to Ridbo Laboratories, Inc.).

Producing ethylene dichloride by reacting ethylene and chlorine in the presence of a catalyst comprising essentially amorphous lead, silver, and antimony No. 2,441,287. Alexander S. Ramage (to Albert A. F. Maxwell).

The process of preparing 3-methyl-butyl, 2-ethyl-hexyl phosphoric acid. No. 2,441,295. Herschel G. Smith and Troy L. Cantrell (to Gulf Oil Corporation).

An (oxycarbalkenyloxy) alkyl N-[(oxycarbalkenyloxy) alkyl] carbamate, wherein each alkenyloxy radical contains a single olefinic linkage attached to the second carbon atom from the oxygen atom therein. No. 2,441,298. Franklin Strain (to Pittsburgh Plate Glass Company).

Water-soluble composition consisting of a dialkyl sulfosuccinate in which the alkyl groups contain from 5 to 10 carbon atoms and an alkali metal benzoate. No. 2,441,341. Emil A. Vitalis (to American Cyanamid Co.).

1,1'-diethyl-6,6'dicumyl-benzoxocarbocyanine. No. 2,441,342. Alfred W. Anish (to General Aniline & Film Corp.).

Process of producing a mixture of **higher alkyl benzene sodium sulfonates** which comprises chlorinating a paraffinic petroleum hydrocarbon distillate, condensing resulting chlorinated hydrocarbons with benzene with the aid of anhydrous aluminum chloride. No. 2,441,351. Lawrence H. Flett (to Allied Chemical & Dye Corporation).

In the recovery of mercaptans from methanol- and ethanol-alkali solutions the step comprising neutralizing the solution with a low molecular weight monocarboxylic acid. No. 2,441,385. Richmond T. Bell (to The Pure Oil Co.).

A-C_6H_4-N=N-C8-NH-NH-C_6H_4-A' wherein A and A' represent an acid group selected from sulfonic and carboxylic acid and salts thereof. No. 2,441,396. Alsoph H. Corwin, George R. Jackson and James L. A. Webb (to Research Corp.).

A process for the separation of acetylenes from a hydrocarbon mixture containing acetylenes and diolefines with an aqueous absorption solution having a pH greater than 7 and containing an organc nitrogen base selected from the class consisting of morpholine and tetraethylene pentamine. No. 2,441,400. Thomas F. Doumani and Davis A. Skinner (to Union Oil Company of California).

The process which comprises heating a mixture containing phenol, a mono-(alpha-phenylethyl) phenol selected from the class consisting of ortho-(alpha-phenylethyl) phenol and para-(alpha-phenylethyl) phenol, and concentrated sulfuric acid until the reaction mass contains ortho-(alpha-phenylethyl) phenol and para-(alpha-phenylethyl) phenol in substantially an equilibrium ratio. No. 2,441,408. Kenneth B. Goldblum (to General Electric Company).

Alkysilicon sols and gels. No. 2,441,423. John R. Elliott and Robert H. Krieble (to General Electric Company).

Preparing α-methacrylonitrile by bringing together acetone cyanohydrin and phosphorus pentoxide. No. 2,441,462. Wolfgang M. Zeischke (to American Cyanamid Company).

Alkyl glycinanilides. No. 2,441,498. Nils Magnus Lofgren and Bengt Josef Lundqvist (to Aktiebolaget Astra, Apotekarnes Kemiska Fabriker).

Preparation of an arylaliphatic amine. No. 2,441,518. Chester M. Suter and Arthur W. Weston (to Sharp & Dohme, Incorporated).

Making allyl alcohol and propionaldehyde by pyrolyzing propylene glycol diacetate to form an allyl acetate, 1-acetoxy propene-1, and acetic acid, removing said acetic acid and hydrolyzing allyl acetate and 1-acetoxy propene-1 to form allyl alcohol. No. 2,441,540. Arthur B. Ash, Raymond E. Carlson and Nathan Koslin and Thomas H. Vaughn (to Wyandotte Chemicals Corporation).

Hydroxylamine stabilized fatty materials. No. 2,441,547. Oscar L. Scherr (to Industrial Patents Corporation).

Mixed ester of a polyhydric alcohol selected from the group consisting of pentaerythritol and poly-pentaerythritols. No. 2,441,555. Robert H. Barth and Harry Burrell. (to Heyden Chemical Corp.).

Preparing a N-arylthiazolinium quaternary salt comprising condensing ethylene dibromide with a N-thioacetylarylamine. No. 2,441,558. Leslie G. S. Brooker (to Eastman Kodak Co.).

Amino methyl phenols. No. 2,441,576. Eldon M. Jones, Albert L. Rawlins and Joseph H. Burckhalter and Walter F. Holcomb (to Parke, Davis & Co.).

Production of pentaerythritol dichloride which comprises the condensation of pentaerythritol with acetone to produce pentaerythritol monoacetonal, heating the pentaerythritol monacetonal with approximately para-toluenesulfonyl chloride and pyridine to produce pentaerythritol monoacetonal dichloride and hydrolyzing the resulting pentaerythritol monoacetonal dichloride to produce pentaerythritol dichloride. No. 2,441,595. Henry Rapoport (to Heyden Chemical Co.).

Recovery of pentaerythritol and other products from an end liquor from the condensation of formaldehyde and acetaldehyde by removing the major proportion of the water by evaporation, diluting and heating the resulting dried product with such a quantity of a water-soluble monohydric alcohol selected from the group consisting of ethanol, n-propanol and isopropanol that a substantial portion of the metal is dissolved, and a substantial portion of the metal formate is not dissolved, separating, removing the major portion of the residual water from the resulting solution with a portion of the alcohol by azeotropic distillation and subsequently removing the crystallized metal formate and pentaerythritol. No. 2,441,602. John E. Snow, Robert H. Barth and Ralph J. Boesel (to Heyden Chemical Corp.).

Compound of the class consisting of diamines and their acid addition salts with nontoxic acids. No. 2,441,665. Walter F. Holcomb and Leon A. Sweet (to Parke, Davis & Co.).

In preparing N-substituted 1-butene-3,4-diamines, the step which comprises reacting a secondary amine selected from the group consisting of lower dialkylamines and lower dialkenylamines with 3,4-dichloro-1-butene. No. 2,441,669. Glen H. Morey (to Commercial Solvents Corp.).

Preparing an aminoaryl monosulfonamide by forming a reaction admixture containing an aminoaryl monosulfonyl chloride by reaction of chlorsulfonic acid with an amino-aryl hydrochloride whereby said aminoaryl monosulfonyl chloride, thereafter aminating said reaction admixture with ammonia. No. 2,441,671. Alexander H. Popkin (to Sun Chemical Corp.).

1-alkoxy-4-hydroxy2,3-dicarb-alkoxy naphthalenes. No. 2,441,702. August H. Homeyer (to Mallinckrodt Chemical Works).

Vacuum treated 1,2-dinitroethane and as a stabilizer therefor an aromatic sulphonic acid. No. 2,441,773. Charles William Scaife (to Imperial Chemical Industries).

Preparation of acylated organic sulfate and sulfonate salts by treating halogen-substituted sulfo-acids and salts with the salt of an acylating substance. No. 2,441,816. Donald F. Holloway and Kurt H. Spitzmueller (to Industrial Patents Corp.).

In preparing vanillic acid free from protocatechuic acid the improvement which comprises reacting vanillin with fused potassium hydroxide. No. 2,441,839. Irwin A. Pearl (to The Institute of Paper Chemistry).

Preparation of acid alkyl sulphates by subjecting an alkyl formate having the formula H-COOR wherein R is an alkyl group, to the action of chlorosulphonic acid in a neutral solvent. No. 2,441,865. Leonce Bert and Michael Procofieff (to Societe Anonyme dite: Societe D'Innovations Chimiques dite: Sinnova ou Sadic).

Producing 2-(alpha-naphthylmethyl)-imidazoline, comprising heating alpha-naphthylacetic acid and ethylene-diamine. No. 2,441,8'7. Sven Carlsson (to Atkiebolaget Recip).

Substituted imidazolones and process of making them. No. 2,441,933. Robert Duschinsky (to Hoffmann-La Roche, Inc.).

Imidazolones and method for their manufacture. No. 2,441,935. Robert Duschinsky (to Hoffmann-La Roche, Inc.).

Imidazolones and method of preparation. No. 2,441,936. Robert Duschinsky (to Hoffmann-La Roche, Inc.).

Dehydrating pinacol by contacting vapors of pinacol, diluted with 15-25% of water vapor and 1-5 times its volume of a non-reactive gas, with an especially prepared catayist comprising a skeletal core of aluminum coated on particles of granular carborundum and extends within the interstices of polyacid anions formed by the reaction at raised temperature of silicic acid and tungstic anhydride. No. 2,441,966. William J. Hale (to National Agrol Co., Inc.).

3,4-dihydroxythiophene-2-keto-butyric acid. No. 2,442,027. Stockton Graeme Turnbull, Jr. (to E. I. du Pont de Nemours & Co.).

Producing acrylonitrile by reacting acetylene and hydrocyanic acid in the presence of an aqueous cuprous halide catalyst, the improvement which comprises incorporating water-soluble salt of mercury. No. 2,442,040. Reginald Thomas Foster (to Imperial Chemical Industries Ltd.).

Making a dialkyldiethoxysilane by reacting an alkyl halide with metallic magnesium and ethyl orthosilicate, the alkyl substituent of said alkyl halide being selected from the class consisting of n-propyl, n-butyl and n-amyl radicals. No. 2,442,053. Rob Roy McGregor and Earl Leathen Warrick (to Corning Glass Works).

Preparing a plasticizer by chlorinating a kerosene until it has a 16% chlorine content, refluxing the chloro-kerosene with phenol in the presence of a condensation catalyst, cooling and washing with aqueous hydrochloric acid and distilling subsequently esterifying said distillation fraction with an organic carboxylic acid. No. 2,442,089. Eugene Lieber (to Standard Oil Development Co.).

Azeotropic distillation of **chloroethyl benzene** from chlorostyrene. No. 2,442,229. Lloyd Berg and James M. Harrison (to Gulf Research & Development Co.).

Azeotropic distillation of **chloroethyl benzene** from chlorostyrene. No. 2,442,230. Lloyd Berg and James M. Harrison (to Gulf Research & Development Co.).

Manufacturing an aliphatic aldol by condensing an aliphatic aldehyde in an anhydrous medium comprising an alcohol and an alkaline condensing agent. No. 2,442,280. Louis Alhéritière (to Les Usine de Melle).

Production of a dihalogenated saturated lower aliphatic compound by reacting a saturated lower aliphatic monohydric alcohol with a hydrogen halide and oxygen in the vapor phase in the presence of a halide of a variable valent metal. No. 2,442,285. Harry A. Cheney (to Shell Development Co.).

In a process for preparing monofluoroacetonitrile, the step of passing monochloroacetonitrile in vapor phase over a mass of argentous fluoride. No. 2,442,290. Harold S. Halbedel, Samuel Z. Cardon and Wilbur J. Shenk (to the Harshaw Chem.).

Making perchlorethylene from a gaseous mixture of methane, chlorine and carbon tetrachloride. No. 2,442,323. Clyde W. Davis, Philip H. Dirstine and William E. Brown (to (to Dow Chemical Co.).

Making carbon tetrachloride and perchlorethylene by chlorination of aliphatic hydrocarbons having from 1 to 3 carbon atoms and the partially chlorinated derivatives thereof. No. 2,442,324. Robert G. Heitz and William E. Brown (to The Dow Chemical Co.).

Sulfonium salts. No. 2,442,339. Edgar C. Britton and John N. Hansen (to The Dow Chemical Co.).

Continuous process for **producing cumene** from a refinery gas containing propylene and a technical grade of benzene. No. 2,442,342. Robert E. Burk and Everett C. Hughes (to The Standard Oil Co.).

Making sodium methyl arsonate by methylating sodium arsenite solution with methyl chloride. No. 2,442,372. George E. Miller and Sidney G. Seaton (to The United States of America, Secretary of War).

Stabilizing an amine by adding a 2-alkyl-4-alkoxyphenol. No. 2,442,457. Joseph A. Chenicek and Robert H. Rosenwald (to Universal Oil Products Co.).

Preparation of tetrahalogenopyrazines from pyrazine, water and halogen. No. 2,442,473. John Mayhew Sayward and James Kenneth Dixon (to American Cyanamid Co.).

Purification and recovery of furfural in extractive distillation of hydrocarbons. No. 2,442,474. Virgil Scarth (to Phillips Petroleum Co.).

Process of rearranging the fatty acid radicals in a triglyceride fat. No. 2,442,531. Eddy W. Eckey (to The Proctor and Gamble Co.).

Treating a triglyceride constituted of combined fatty acids the said combined fatty acids consisting predominantly of unsaturated fatty acids, which comprises contacting with a low temperature molecular rearrangement catalyst. No. 2,442,533. Eddy W. Eckey (to The Proctor and Gamble Co.).

Process of interesterification comprising intimately contacting a fatty acid glyceride with a low temperature interesterification catalyst in the presence of an organic compound, which is (1) compatible with said catalyst, (2) has at least one uneesterified alcoholic hydroxyl group and (3) is at least partially soluble in said glyceride to cause rearrangement of the fatty acid radicals in the glyceride molecules. No. 2,442,534. Eddy W. Eckey (to The Proctor and Gamble Co.).

Process of interesterifying a triglyceride comprising contacting the triglyceride with a low temperature interesterification catalyst at a temperature sufficently low to permit progressive crystallization of triglycerides of low solubility as the same are formed during interesterification. No. 2,442,535. Eddy W. Eckey (to The Proctor and Gamble Co.).

Producing chloroacetonitrile by treating an aqueous solution of aminoacetonitrile with hydrochloric acid, adding sodium nitrite and recovering the chloroacetonitrile. No. 2,442,542. Ingenuin Hechenbleikner (to American Cyanamid Co.).

Producing iminodiacetonitrile by bringing dry gaseous ammonia into contact with monochloracetonitrile. No. 2,442,547. Jerome L. Mostek (to Sinclair Refining Co.).

Diethylaminoethyl piperate hydrochloride. No. 2,442,555. Martin E. Synerholm (to Boyce Thompson Institute for Plant Research).

A quaternary ammonium salt of an acid ester of a phosphorus acid and an oxazoline compound. No. 2,442,582. John W. Bishop (to Tide Water Associated Oil Co.).

Purification of perfluoroheptane by azeotropic distillation with methyl ethyl ketone. No. 2,442,589. Latimer R. Evans and Henry B. Hass (to U. S. A. as represented by the U. S. Atomic Energy Commission).

Resolution of a mixture of the stereoisomers of cis-2-(4'-car-

boxy-butyl)-3:4-ureido-tetrahydrothiophene. No. 2,442,681. Karl Folkners, Ralph Mozingo, and Donald E. Wolf (to Merck & Co., Inc.).

Preparation of methyl acrylate from methyl lactate by acetylating the methyl lactate with acetic anhydride, flashing the resulting acetylation liquor, and directly pyrolyzing the flashed vapor. No. 2,442,716. Samuel M. Weisberg and Edwin G. Stimpson (to National Dairy Research Laboratories, Inc.).

Producing melamine by mixing with an aqueous solution of a hydroxide of an alkali-forming metal a condensation product of dicyandiamide and a ketone selected from the group consisting of acetone, methyl ethyl ketone and cyclohexanone, said condensation product having the formula

$$(H_2N.CN)_4Y.2HX$$

in which Y is a member of the group consisting of acetone, methyl ethyl ketone and cyclohexanone and X is the anion of a strong acid. No. 2,442,729. Alexander F. MacLean (to American Cyanamid Co.).

Reaction product of 2,4,5-triamino-6-hydroxy-pyrimidine and a member of the group consisting of N-(2,3-dihydroxy-2-propenylidene) amino-benzoic acid, its salts, esters and amides and recovering the said product. No. 2,442,836. Robert B. Angier (to American Cyanamid Co.).

Reaction product of 2,4,5-triamino-6-hydroxy pyrimidine, reductons and an amino acid amide of para-aminobenzoic acid. No. 2,442,837. Robert B. Angier (to American Cyanamid Co.).

Preparing the oxime of 1-diethylamino-4-pentanone in which the pentanone is prepared by acidic decarboxylation of aceto-γ-diethylamino-butyric acid. No. 2,442,854. Marlin T. Leffler and James E. Rundell (to Abbott Laboratories).

Heterocyclic substituted phenacylpyridines. No. 2,442,865. James M. Smith, Jr. (to American Cyanamid Co.).

Preparing pyrimidine compounds by 2,4,5-triamino-6-hydroxypyrimidine, a member of the group consisting of mucohalic acids and esters thereof, and a member of the group consisting of para-aminobenzoic acid and amides thereof. No. 2,442,867. Coy W. Waller and James H. Boothe (to American Cyanamid Co.).

Hydrolyzing fats and fatty oils by heating in admixture with water and a hydrolyzing agent comprising sulfonic acids of a polyalkylated benzene fraction. No. 2,442,925. William K. Griesinger (to Atlantic Refining Co.).

Scrubbing acetaldehyde from a gaseous mixture containing it in admixture with at least one normally gaseous substance which comprises bringing the said gaseous mixture into intimate contact with acetic acid which contains in solution therein up to one-half of one per cent of acidic polymerizing agent selected from the group consisting of sulfuric, phosphoric, and p-toluene sulphonic acids, capable of converting the acetaldehyde to paraldehyde. No. 2,442,942. Karl Heinrich, Walter Tuerck and Eric Harvey Brittain (to Distillers Co.).

Making the potassium salt of ortho formotoluide by reacting ortho-formotoluide and potassium hydroxide in the presence of a non-polar liquid. No. 2,442,952. Garry C. Kitchens (to Burton T. Bush, Inc.).

Dehydrofluorinating a polyfluoroalkane. No. 2,442,993. Oliver Wilfred Cass (to E. I. DuPont de Nemours & Co.).

Preparing difluoroacetic acid by heating a mixture of 2,4,6-tri-(difluoromethyl)-s-triazine and water in the presence of a basic catalyst. No. 2,442,995. Donald D. Coffman (to E. I. DuPont de Nemours & Co.).

Obtaining organic fluorine-containing sulfur compounds by heating a haloethylene having the general formula $X_2C{=}CX_2$ wherein the X substituents are halogen atoms having an atomic weight of less than 40 and at least two of said X substituents are fluorine atoms with an organic compound containing a total of not more than eight carbon atoms, selected from the class consisting of saturated hydrocarbon sulfides, disulfides and thiols. No. 2,443,003. William E. Hanford (to E. I. DuPont de Nemours & Co.).

Vinyl ester of a polyfluorocyclobutane-monocarboxylic acid containing not more than four fluorine atoms and having solely hydrogen atoms attached to one of the ring carbon atoms adjacent to the carboxyl-bearing carbon atom of said ring. No. 2,443,005. Ralph A. Jacobson (to E. I. DuPont de Nemours & Co.).

Hydrogenated polyalkylated phenol. No. 2,443,015. Arthur C. Whitaker and William W. Weinrich (to Gulf Research & Development Co.).

Catalytic ring hydrogenation of a mononuclear aromatic hydrocarbon to the corresponding saturated cycloaliphatic hydrocarbon which comprises bringing hydrogen into contact with a member of the group consisting of benzene and alkylated benzenes in the presence of a catalytic amount of metallic sodium under a pressure of at least 100 pounds per square inch. No. 2,443,016. Gerald M. Whitman (to E. I. DuPont de Nemours & Co.).

Ether of the formula R-O-CF$_2$CHXCN where R is an alkyl radical, and X is selected from the group consisting of chlorine and fluorine. No. 2,443,024. David W. Chaney (to American Viscose Corp.).

Preparing 2-imino-3-aliphatic oxazolidines which comprises reacting a cyanogen halide with an N-aliphatic monoethanolamine in the presence of a hydrogen halide acceptor selected from the group consisting of alkaline earth metal and alkali metal oxides, alkoxides, and hydroxides. No. 2,443,062. Benjamin Abramovitch (to American Cyanamid Co.).

Separating stearic acid from impurities comprising other fatty acids by forming a solution of anhydrous ketone having from 4 to 9 carbon atoms and being selected from the group consisting of the unsubstituted dialkyl ketones and the unsubstituted cycloalkyl ketones. No. 2,443,063. David E. Adelson (to Shell Development Co.).

2-amino-4-hydroxy-6-methyl pyrimido (4,5-b)pyrazine. No. 2,443,078. John H. Mowat (to American Cyanamid Co.).

3,3 bis (4-dimethylamino 3-methyl phenyl) phthalide. No. 2,443,092. Clyde S. Adams (to The National Cash Register Co.).

Preparation of a trichloro acid of the formula R.CCl$_2$.COOH where R is selected from the group consisting of Cl-CH$_2$Cl-, and CH$_2$CHCl- which comprises reacting the trichloro aldehyde, in the presence of at least a small amount of water, with a hypochlorite which furnishes hypochlorite ion. No. 2,443,118. Ralph E. Plump (to Pennsylvania Salt Mfg. Co.).

In the manufacture of a water-insoluble salt of an alkyl dithiocarbamic acid by a process comprising reacting in aqueous solution a water-soluble inorganic salt having a cation chosen from the class consisting of zinc, lead, and copper with a water-soluble salt of the alkyl dithiocarbamic acid, of which the water-insoluble salt is desired, the improvement comprising mixing a surface active agent with said aqueous solution of the reactants prior to completion of the reaction to increase the yield of said water-insoluble salt. No. 2,443,160. Dudley M. Gallagher and Leslie A. Gillette (to Sharples Chemicals Inc.).

In a process for reacting in aqueous medium a water-soluble zinc salt with a water-soluble salt of an alkyl dithiocarbamic acid to form the corresponding water-insoluble zinc salt of said alkyl dithiocarbamic acid, the step which comprises causing said reaction to take place with agitation in the presence of a water-insoluble solvent for said water-insoluble zinc salt. No. 2,443,161. Leslie A. Gillette (to Sharples Chemicals Inc.).

Preparing pterins by reacting 2,4,5-triamino-6-hydroxypyrimidine, a trihalo acetone and a member of the group consisting of aminobenzoic acid and amides thereof. No. 2,443,165. Martin E. Hultquist & Paul F. Dreisbach (to Amer. Cyanamid Co.).

Chlorination of ethanol by adding ethanol to chloral alcoholate and other products of chlorination of ethanol and chlorinating. No. 2,443,183. Oliver W. Cass (to E. I. DuPont de Nemours & Co.).

Separation of myrcene from beta-pinene by treating said mixture with a compound which has the formula HX in which X is a negative radical selected from the group consisting of halogen, alkoxy, aryloxy, acyloxy, and hydroxy, under acid conditions and fractionating the treated mixture. No. 2,443,204. William David Stallcup (to The Glidden Co.).

Preparation of phenylalkylamines by reacting, in the presence of a substantially anhydrous aluminum halide, an aromatic compound, having a replaceable hydrogen linked to at least one of its nuclear carbons, which is a member of the group consisting of benzene, naphthalene, alkyl-benzenes, alkyl-naphthalenes, alkoxy-benzenes, alkoxy-naphthalenes, hydroxy-benzenes, hydroxy naphthalenes, halo-benzenes, and halo-naphthalenes with an amino tertiary alcohol. No. 2,443,206. Chester M. Suter.

Extraction of methyl chloride from hydrocarbons by treating a hydrocarbon mixture comprising a major portion of butylene and having dissolved therein appreciable amounts of methyl chloride with an alcohol having substantial solubility in water. No. 2,443,229. Oliver H. Dawson and Hampton G. Cornell (to Standard Oil Development Co.).

Preparation of certain diarylacetonitriles by mixing a compound selected from the group consisting of mandelonitrile and alkyl substituted mandelonitriles with a compound selected from a group consisting of benzene and alkyl benzenes, and aluminum chloride. No. 2,443,246. August H. Homeyer and Janet S. Splitter (to Mallinckrodt Chemical Works).

Production of mesitylene by mixing about 1 part by weight of ortho-xylene with about 2-3 parts by weight of anhydrous aluminum chloride and about 1/3 part by weight of absolute methyl alcohol. No. 2,443,247. William C. Howell, Jr. (to Standard Oil Development Co.).

Derivatives of 2-amino-diphenylsulfone. No. 2,443,255. Donovan E. Kvalnes (to E. I. DuPont de Nemours & Co.).

Friedel-Crafts condensation of furane and its derivatives with unsaturated triglycerides. No. 2,443,269. Anderson W. Ralston, Miles R. McCorkle and Robert J. Vander Wal (to Armour and Co.).

Preparation of monosulfones of conjugated diolefins by reacting sulfur dioxide with a hydrocarbon mixture containing conjugated diolefin. No. 2,443,270. Richard F. Robey and Charles E. Morrell (to Standard Oil Development Co.).

Making a polyhydric compound having hydroxyl groups on adjacent carbon atoms by reacting a mono-olefinic compound taken from the group consisting of high molecular weight mono-olefinic aliphatic carboxylic acids and their esters with a mixture of hydrogen peroxide, acetic acid, and catalytic quantities of sulfuric acid followed by hydrolysis of the product. No. 2,443,280. Daniel Swern and John T. Scanlan (to U. S. A. as represented by the Secretary of Agriculture).

Preparing trichloracetamide by hydrolyzing trichloro-acetonitrile with aqueous hydrochloric acid. No. 2,443,291. Oscar W. Bauer and John W. Teter (to Sinclair Refining Co.).

Ammonolysis of monochloralkyl nitriles by reacting the corresponding monochloroalkylnitrile with liquid anhydrous ammonia. No. 2,443,292. Oscar W. Bauer and John W. Teter (to Sinclair Refining Co.).

Hydroxypyrimidine derivatives. No. 2,443,303. Francis Henry Swinden Curd, Margaret Isabel Hall (nee Davis), Edmund Cecil Owen, Francis Leslie Rose, George Alfred Peter Tuey (to Imperial Chemical Industries Limited).

Halogenopyrimidine derivatives. No. 2,443,304. Francis Henry Swinden Curd, Margaret Isabel Hall (nee Davis), Edmund Cecil Owen, Francis Leslie Rose, George Alfred Peter Tuey (to Imperial Chemical Industries Limited).

Pyrimidine derivatives by reacting an aromatic amine with a pyrimidine compound. No. 2,443,305. Francis Henry Swinden Curd, Margaret Isabell Hall (nee Davis), Edmund Cecil Owen, Francis Leslie Rose, George Alfred Peter Tuey (to Imperial Chemical Industries Limited).

Preparation of α-hydroxy-β,β-dimethyl-γ-butyrolactone by condensing isobutyraldehyde with formaldehyde in water solution in the presence of aqueous alkali cyanide. No. 2,443,334. Russell W. Van House (to Parke, Davis & Co.).

Preparing siloxanes by interacting a dialkyl siloxane with a diorgano siloxane of the type RR'SiO where R is a monocyclicaryl radical and R' is selected from the group consisting of alkyl and monocyclicaryl radicals. No. 2,443,353. James Franklin Hyde and William Herbert Daudt (to Corning Glass Works).

Producing carbon disulfide by introducing sulfur dioxide into the bottom of a permeable vertical column of active carbon. No. 2,443,383. David L. Gamble, Howard M. Cyr and Charles W. Siller and Gaius W. Bisbing (to The New Jersey Zinc Co.).

Preparing a chloroalkylamine hydrochloride by reacting a hydroxyalkylamine hydrochloride with chlorine. No. 2,443,385. Albert F. Hardman (to Wingfoot Corp.).

Production of trichlorotetrahydropyran by reacting a hydropyran with chlorine. No. 2,443,388. Peter A. Hawkins and Nicholas Bennett (to Imperial Chemical Industries Limited).

Synthesis of nitriles of the formula R(CN)n, R being a hydrocarbon radical, n being an integer from 1 to 2 inclusive, which comprises reacting ammonia with an aldehyde in the presence of a metallic catalyst containing both copper and zinc. No. 2,443,420. William F. Gresham (to E. I. DuPont de Nemours & Co.).

Preparation of epsilon-caprolactone by passing ketene into tetrahydrofuran in the presence of an acidic condensation catalyst.

No. 2,443,451. William E. Grigsby (to E. I. DuPont de Nemours & Co.).

Continuous preparation of glycolic acid from a reaction mixture of formaldehyde, carbon monoxide and a compound supplying water for the reaction. No. 2,443,482. Morris T. Shattuck (to E. I. DuPont de Nemours & Co.).

Production of 2-chlorofuran by introducing chlorine into a flowing stream of furan vapor. No. 2,443,493. Oliver W. Cass and Harry B. Copelin (to E. I. DuPont de Nemours & Co.).

Production of unsaturated chloronitriles by reacting succinonitrile with chlorine in the liquid phase. No. 2,443,494. Oliver W. Cass (to E. I. DuPont de Nemours & Co.).

Preparing β.β'-dicyanodiethyl cyanamide by the step of reacting acrylonitrile with cyanamide in the presence of alkaline catalyst. No. 2,443,504. Ingenuin Hechenbleikner (to American Cyanamid Co.).

Canadian

Producing a carbonate of 1-R-1-aminoethane in which R is an aliphatic hydrocarbon having from 4 to 9 atoms, by causing 1-R laminoethane to react with carbon dioxide and with water. No. 449,181. Horace A. Shonle and Ewald Rohrmann.

Purifying naphthalene in the solid state by extracting impurities from comminuted naphthalene with petroleum naphtha together with an aliphatic alcohol. No. 449,209. John E. Schulze.

A mercurated alkyl amide of an aromatic di-basic acid compound having the formula: Y-NX-CO-R-CO-Z in which R is selected from the group consisting of the phenylene radical and homologues thereof, X and Y are selected from the group consisting of hydrogen and lower alkylene, alkyl and hydroxyalkyl groups and Z represents the mercurated alkyl amide group. No. 449,222. Donalee L. Tabern (to Abbott Labs.).

12-aminostearic acid. No. 449,253. William Edward Hanford (to Canadian Industries Ltd.).

Producing 7-dehydro-cholesterol from cholesterol and its carboxylic acid esters. No. 449,258. Hans Reinhard Rosenberg (to Canadian Industries, Ltd.).

Preparation of terminally halogen substituted alkenes containing from one to two units of a diene which comprises bringing a member of the group consisting of aliphatic 1,3-dienes and sulphur dioxide adducts thereof in contact with at least its molecular equivalent of a polyhalogenated alkane. No. 449,263. Wesley Rasmus Peterson (to Canadian Industries, Ltd.).

Crystalline addition compounds of 7-hydroxy cholesterole and an organic acid of two carbon atoms. No. 449,264. Hans Reinhard Rosenberg and Fleming Carroll (to Canadian Industries, Ltd.).

Process for producing 7-hydroxy-cholesterol-7-monobenzoate which comprises heating the 3-trityl ether of 7-hydroxy-cholesterol-7-benzoate in the presence of glacial acetic acid to convert the 3-ether group to a hydroxyl group. No. 449,266. Stockton Graeme Turnbull, Jr. (to Canadian Industries, Ltd.).

Reacting thiolacetic acid with alpha-acetylaminoacrylic acid and hydrolyzing the alpha-acetylamino-beta-acetylthiopropionic acid to the alpha-aminobeta-mercaptopropionic acid. No. 449,270. Mark Wendell Farlow (to Canadian Industries Ltd.).

Alpha-chloro-beta-acetylthiopropionic acid. No. 449,271. William Jennings Peppel (to Canadian Industries, Ltd.)

N-(acetylthiomethyl) benzamide. No. 449,272. William James Burke (to Canadian Industries, Ltd.)

Obtaining N-methylamides by reacting a carbonamide compound with hydrogen in the presence of an active metal hydrogenation catalyst. No. 449,274. Mark Wendell Farlow (to Canadian Industries, Ltd.)

Reacting an aliphatic monoaldehyde and an organic amide of a monoamine with an organic monobasic acid with an organic solvent soluble cellulosic ester. No. 449,280. David Willcox Woodward (to Canadian Industries Ltd.).

Reacting butadiene with hydrogen cyanide by bringing the same in contact in the presence of a Friedel-Crafts type catalyst. No. 449,338. Donald Drake Coffman and Leroy Frank Salisbury (to E. I. du Pont de Nemours & Co.).

Manufacture of 4-aryl-piperidine-4-nitrile derivatives by heating an α : α-bis-(B'-halogenalkyl)-arylaceto-nitrile with a primary amine. No. 449,385. Franz Bergel, Nathan Chadwick Hindley, Alexander Lang Morrison and Heinrich Rinderknecht (to Roche Products Ltd.).

3,4-$Cl_2C_6H_3SO_2NHC_6H_4NO_2$-4. No. 449,386. William F. Hester (to Rohm & Haas Co.).

Product from the reaction of an alkylated phenol with a condensation product of turpentine and phosphorus pentasulphide the alkyl group being a saturated aliphatic radical. No. 449,388. Robert L. May (to Sinclair Refining Co.).

Reaction product of zinc oxide and an organic compound resulting from the reaction of the condensation product of turpentine and phosphorus pentasulphide with an alkylated phenol the alkyl group of the alkylated phenol being a saturated aliphatic radical. No. 449,389. Robert L. May (to Sinclair Refining Co.).

Reacting a compound of the group consisting of guanylureas and guanylthioureas with a p-W-benzene-sulphonyl halide, where W is a radical of group consisting of radicals hydrolysable to an amino group and radicals reducible to an amino group. No. 449,459. Philip Stanley Winnek (to American Cyanamid Co.).

Manufacture of mercapto-thiazoline by reacting a 2-amino alkyl sulphuric acid, with a preformed alkali trithiocarbonate in a solvent selected from the class consisting of water, alcohol, and alcohol-water. No. 449,557. Louis Harold Howland (to United States Rubber Co.).

Continuous process of making DDT by the condensation of monochlorobenzene with chloral with fuosulphonic acid as the condensing agent. No. 449,652. Charles William Gates (to Dominion Rubber Co., Ltd.).

Producing alkyl allyloxyacetate, from allyl alcohol chloroacetic acid and a reagent which acts as a base. No. 449,633. Gaetano F. D'Alelio (to Canadian Electric Co.).

Dealkylation of α, β - bis - (p - alkoxyphenyl) - α, β - disubstituted ethanes and p-p'-dialkoxy-α,β-disubstituted stilbenes. No. 449,670. Joseph Corse (to Eli Lilly & Co.).

Carbalkoxylation of phenylacetic esters which comprises reacting a phenylacetic ester with a substantially alcohol-free alkali metal alcoholate and a dialkyl carbonate. No. 449,671. Vernon H. Wallingford and August H. Homeyer (to Mallinckrodt Chemical Works).

Preparing acrylonitrile by passing ethylene cyanohydrin over a dehydrating catalyst. No. 449,683. Le Roy U. Spence (to Rohm & Haas Co.).

Deodorizing and decolorizing levulinic acid with sodium chlorite and hydrogen peroxide. No. 449,689. Wendell W. Moyer (to A. E. Staley Mfg. Co.).

Plasticized "prolamine-base" protein comprising plasticized "prolamine-base" protein having as plasticizer therefor ether phenol in which the total number of carbon atoms in the molecule is not in excess of 18. No. 449,777. Willard L. Morgan (to American-Maize Products Co.).

Plasticized "prolamine-base" protein comprising plasticized "prolamine-base" protein having as plasticizer substituted carbamide carrying at least one hydroxylated organic substituent on a nitrogen atom. No. 449,778. Willard L. Morgan (to American-Maize Products Co.).

Plasticized "prolamine-base" protein comprising plasticized "prolamine-base" protein having as plasticizer substituted carbamide carrying on at least one nitrogen atom at least one aminated organic substituent characterized by the group =NH.. No. 449,779. Willard L. Morgan (to American-Maize Products Co.).

Alkali metal salts of the sulphuric acid esters of 1,4-di(beta-hydroxy-isopropylamino)-anthraquinone. No. 449,796. Frank Loge, Arthur Lowe and William Wyndham Tatum (to Canadian Industries Ltd.).

Preparation of beta-nitro-ethyl ethers which comprises refluxing with an alcohol, a substance from the group consisting of 1:2 dinitro-ethane and beta-nitroethyl nitrate. No. 449,800. Arthur Ernest Wilder Smith, Robert Holroyd Stanley and Charles William Scaife (to Canadian Industries Ltd.).

1,1,2,2-tetrafluoroethyl phenyl ether. No. 449,807. William Edward Hanford and George Wayne Rigby (to Canadian Industries Ltd.).

The reaction product of piperonyl aldehyde and gluconic acid to produce a solution which, when added to alkaline aqueous baths, temporarily forms an emulsion that breaks to a clear solution. No. 450,023. Allan E. Chester and Frederick F. Resinger (to Poor & Co.).

Ethyl alcohol from sulphite residual liquor by neutralizing the residual liquor by the addition of caustic magnesia concentrating the neutralized liquor and fermenting. No. 450,163. George H. Tomlinson (to Howard Smith Paper Mills Ltd.).

Methyl-beta-chloroacrylate. No. 450,185. Joy Gabriel Lichty (to Wingfoot Corp.).

2,3-Dichloro-N-propyl-alpha-chloroacrylate. No. 450,186. Joy Gabriel Lichty (to Wingfoot Corp.).

Preparation of carboxyacylaminoarylsulphonyl derivative of an aminothiazole by heating together an aminoarylsulphonamidothiazole with a member of the group consisting of a polycarboxylic acid or the anhydride, ester, or monohalide thereof, or monohalide of the ester. No. 450,244. Maurice L. Moore.

Anhydride of a carboxylic acid by heating a carboxylic acid with a liquid acetic anhydride in the presence of an organic liquid. No. 450,259. James Wotherspoon Fisher (to Canadian Celanese Ltd.).

Alkaline salt of p-azobenzene sulfonic acid by mixing nitrobenzene with aqueous alkaline sulphite waste liquor and heating. No. 450,302. Harry F. Lewis and Irwin A. Pearl (to the Institute of Paper Chemistry).

Production of succinic acid by subjecting tetramethylene oxide to the action of an oxidizing agent comprising a direct electric current. No. 450,353. Joseph E. Bludworth, Samuel Jeffries and Max O. Robeson (to Camille Dreyfus).

Packaging

Filling apparatus for volatile liquids with vapor return conduit. No. 2,439,887. Peter M. Elliott (to Oil Distribution Appliances Limited).

Making grease- and moistureproof coated paperboard. No. 2,443,221. Samuel Bergstein (to Robert Morris Bergstein and Frank David Bergstein).

Canadian

Multiwall container. No. 449,776. Richard W. Lahey (to American Cyanamid & Chemical Corp.).

Paints, Pigments

Process for producing an improved rutile titanium oxide pigment comprising subjecting, prior to heat treatment to develop its pigment properties anatase raw pigment titanium oxide to mechanical disintegration treatment to reduce the particle size then calcining in the presence of a titanium-oxygen compound rutile conversion promoter. No. 2,439,895. John Lewis Keats and James Howard Peterson (to E. I. du Pont de Nemours & Company).

Preparing a composite pigmentary material, which comprises heating finely divided titanium dioxide in the presence of vaporized aluminum chloride. No. 2,441,225. Alphonse Pechukas (to Pittsburgh Plate Glass Company).

Preparation of titanium dioxide by leaching an iron-bearing titanium ore with hydrochloric acid. No. 2,441,856. Joseph L. Turner and Walter W. Plechner (to National Lead Co.).

Canadian

Finely divided titanium dioxide which has been calcined at a temperature of at least about 1350° C. treated with vapours of a methyl silicon chloride mixture and thereafter heated at a temperature of from 60° to 100° C. No. 449,791. Moyer M. Safford (to Canadian General Electric Co., Ltd.).

Paper, Pulp

In a process for improving the color of **partially esterified wood pulp** the step which comprises subjecting said partially esterified wood pulp to the action of a lower aliphatic peracid and a lower aliphatic acid. No. 2,442,332. Clifford I. Haney and Mervin E. Martin (to Celanese Corp. of America).

Process for waxing paper. No. 2,443,222. Samuel Bergstein (to Robert Morris Bergstein and Frank David Bergstein.).

Canadian

Apparatus for defibrating lignocellulose containing materials. No. 449,189. Arme Johan Arthur Asplund.

Producing a moistureproofed wrapping tissue wherein a thermosetting, partially polymerized, synthetic resin is first applied to a base film of non-fibrous cellulose material, then reacted to the final insoluble stage, and the resulting film is thereafter coated with a moistureproofing coating of the type comprising a cellulose derivative, a wax and a solvent. No. 449,279. Gilbert Pitzl (to Canadian Industries Ltd.).

Degradation process which comprises reacting sulfonated lignin material with calcium hydroxide. No. 449,357. Fritz E. Brauns and Irwin A. Pearl (to The Institute of Paper Chemistry).

Treatment of black liquors by subjecting to a heat pressure treatment without pyrolysis. No. 450,221. Otto Vilhelm Holm.

Petroleum

A composition of matter for use as a lubricant and as an addition agent to improve the characteristics of lubricating oils, a dual-reactive metal compound of the reaction product of a phosphorus sulfide and an ester wax. No. 2,439,821. John M. Musselman (to The Standard Oil Company).

Refining of petroleum distillates. No. 2,440,258. Laverne P. Elliott and Melvin M. Holm (to California Research Corporation).

Lubricating oil having incorporated therein an oil-soluble metal salt of the reaction product of a methylol-forming aromatic compound with equimolecular quantities of formaldehyde and a secondary amine. No. 2,440,375. Rush F. McCleary (to the Texas Company).

Recovery of hydrogen fluoride in an alkylation process. No. 2,440,454. Roy E. Vinyard (to Phillips Petroleum Company).

Process for producing unsaturated hydrocarbons containing branched carbon chains. No. 2,440,497. Carl Winning and Dilworth T. Rogers (to Standard Oil Developement Company).

Preventing erosion in fluidized catalytic cracking of hydrocarbons. No. 2,440,591. Warren K. Lewis (to Standard Oil Development Company).

Process for isomerizing a hexane fraction. No. 2,440,751. Harold R. Legatski (to Phillips Petroleum Co.).

Destructive hydrogenation of petroleum residues. No. 2,440,869. Charles W. Montgomery, Joseph Burns McKinley and Victor J. Anhorn (to Gulf Research & Development Company).

Turbine oil which comprises a petroleum lubrication oil fraction with which there has been compounded an alpha, alpha'-thiocarbono-dialiphatic acid. No. 2,440,991. Stephen J. Wayo (to Sinclair Refinery Co.).

Lubricanting oil compositions containing polymerized allyl esters of carboxylic acids. No. 2,441,023. Robert G. Larsen and Kenneth E. Marple (to Shell Development Company).

Alkylation process. No. 2,441,102. Jacob R. Meadow (to Socony-Vacuum Oil Company).

Alkylation process. No. 2,441,103. Jacob R. Meadow (to Socony-Vacuum Oil Company).

Cracking hydrocarbons in the presence of bromine-containing terpenic compounds. No. 2,441,142. Hillis O. Folkins (to The Pure Oil Co.).

Hydrocarbon conversion by contact with active catalyst and inert solid heat carrying material. No. 2,441,170. Frank William Rose and Frederick Walter Steuber (to Houdry Process Corp.).

Liquid petroleum distillate containing a metallized amino azo dye. No. 2,441,172. Sol Shappirio.

An odor and flavor free microcrystalline petroleum hydrocarbon wax. No. 2,441,202. Curtis E. Maier and Jay D. Green (to Continental Can Company, Inc.).

Cracking hydrocarbon liquids to gasoline in the presence of a substance selected from the group (1) consisting of bromine, hydrogen bromide, phosphorus bromides and meta- and metalloid-free organic bromine compounds, and a small amount of a substance selected from the group (2) consisting of halogen-free terpenes and their derivatives. No. 2,441,240. Hillis O. Folkins (to The Pure Oil Co.).

Continuous alkylation process by a sulfuric acid catalyst and boron fluoride in the presence of a controlled liquid propane concentration. No. 2,441,249. Cecilio L. Ocon and Ernest A. Ocon (to Ernest A. Ocon).

Process for dehydrogenation of hydrocarbons by contact with catalysts supported on alumina stabilized by aluminum phosphate. No. 2,441,297. Robert I. Stirton (to Union Oil Company of California).

Mineral oil composition comprising a viscous mineral oil fraction with a minor proportion, sufficient to impart improvement to said oil fraction, of an oil-soluble, acidic, phosphorus-, sulfur- and nitrogen-containing reaction product obtained by reacting a phosphorus sulfide and a phosphorous amine of an alkyl-substituted hydroxyaromatic compound. No. 2,441,331. Orland M. Reiff and Harry J. Andress, Jr. (to Socony-Vacuum Oil Company).

Method and apparatus for **educting oil from shale** by utilizing hot spent shale. No. 2,441,386. Clyde H. O. Berg (to Union Oil Company of California).

Desulfurizing hydrocarbons without substantial decomposition of the hydrocarbons by contacting with a boron phosphate-alumina catalyst. No. 2,441,493. Robert C. Krug (to The Atlantic Refining Company).

A lubricant comprising an oil of lubricating viscosity and minor proportion of sulfurized monomeric olefin. No. 2,441,496. Bert H. Lincoln, Gordon D. Byrkit and Waldo L. Steiner (to Continental Oil Company).

Recovering and reconcentrating spent sulfuric acid which has been used as an alkylation catalyst. No. 2,441,521. Johannes H. A. P. Langen van der Valk and Jan D. Ruys (to Shell Development Company).

Cyclic process for separating aromatic hydrocarbons from a mixture of hydrocarbons which comprises treating said mixture with silica gel to adsorb aromatic hydrocarbons. No. 2,441,572. Alfred E. Hirschler and Moses Robert Lipkin (to Sun Oil Co.).

Preparing lubricants and additives for mineral oils to improve their lubricating properties, which process comprises reacting a part of a total amount of phosphorus sulfide with an organic oxygen-containing compound. No. 2,441,587. John M. Musselman (to The Standard Oil Co.).

Cracking hydrocarbon oil by vaporizing the oil at a temperature below the final cracking temperature and at a rate sufficient to avoid substantial cracking, thereafter injecting a finely divided catalytic material into said oil vapors while said catalytic material is at an initial temperature materially above the final cracking temperature, to rapidly increase the temperature of the oil vapors to the final desired cracking temperature. No. 2,441,666. Frank B. Johnson (to Standard Oil Development Co.).

Method for supplying continuously a small quantity of finely divided aluminum chloride to a hydrocarbon isomerization reaction zone. No. 2,441,820. Joseph W. Jewell (to The M. W. Kellogg Co.).

Production of long-chain olefins by catalytic cracking of paraffinic wax. No. 2,441,962. William I. Gilbert and Charles W. Montgomery (to Gulf Research and Development Co.).

Producing high olefin content gasoline which comprises subjecting hydrocarbon oil under catalytic cracking conditions to contact with a catalyst comprising a hydrated magnesium silicate-calcium silicate compound. No. 2,441,974. William A. Pardee and Charles W. Montgomery (to Gulf Research & Development Co.).

Producing an orderless fraction of branched chain paraffin hydrocarbons. No. 2,442,011. Harold R. Legatski (to Phillips Petroleum Co.).

Producing an aromatic fraction in the gasoline boiling range from relatively heavy naphthas. No. 2,442,060. Robert M. Shepardson (to Standard Oil Development Co.).

Process for breaking petroleum emulsions of the water-in-oil type, by the action of an acidic partial ester containing: (a) at least one polyhydric alcohol radical; (b) at least one diglycolic acid radical; and (c) a plurality of acyloxy radicals, each having 8 to 32 carbon atoms. No. 2,442,073. Melvin De Groote and Arthur F. Wirtel (to Petrolite Corp., Ltd.).

Process for breaking petroleum emulsions of the water-in-oil type by subjecting the emulsion to the action of an acidic partial ester containing. (a) a polyhydric alcohol radical; (b) a diglycollic acid radical; and (c) an acyloxy radical containing 8 to 32 carbon atoms. No. 4,442,074. Melvin De Groote and Arthur F. Wirtel (to Petrolite Corp., Ltd.).

Process for breaking petroleum emulsions of the water-in-oil type, by subjecting the emulsions to the action of the esterification product of (a) a hydroxylated basic tertiary amine; and (b) the resultant obtained by esterification between diglycollic acid and a basic acylated aminoalcohol in which there is at least one occurrence of the radical RCO.(OR')nN< in which RCO is the acyl radical of a monocarboxy detergent-forming acid having at least 8 and not more than 32 carbon atoms; the amino nitrogen atom is basic: R' is an alkylene radical having at least 2 and not more than 32 carbon atoms; the amino nitrogen atom is varying from 1 to 10. No. 2,442,075. Melvin De Groote and Arthur F. Wirtel (to Petrolite Corp., Ltd.).

Process for breaking petroleum emulsions of the water-in-oil type by subjecting the emulsion to the action of the esterification product of (A) an acidic partial ester containing (a) at least one polyhydric alcohol radical, (b) at least one diglycollic acid radical, and (c) a plurality of acyloxy radicals, each having 8 to 32 carbon atoms and (B) a basic hydroxylated tertiary amine. No. 2,442,076. Melvin De Groote and Arthur F. Wirtel (to Petrolite Corp., Ltd.).

Process for breaking petroleum emulsions of the water-in-oil type by subjecting the emulsion to the action of the resultant obtained by esterification between diglycollic acid and a basic acylated aminoalcohol in which there is at least one occurrence of the radical RCO.(OR')nN< in which RCO is the acyl radical of a monocarboxy detergent-forming acid having at least 8 and not more than 32 carbon atoms; the amino nitrogen atom is basic; R' is an alkylene radical having at least 2 and not more than 10 carbon atoms; and n is a small whole number varying from 1 to 10. No. 2,442,077. Melvin De Groote and Arthur F. Wirtel (to Petrolite Corp., Ltd.).

Pyrolysis of fluid hydrocarbons. No. 2,442,093. Charles Gordon Milbourne (to The United Gas Improvement Co.).

Catalyst composition to catalyze the dehydrogenation of monoolefins and alkylated aromatics which consist of beryllium oxide, iron oxide, an alkali forming potassium compound, and metal oxide from the group consisting of copper oxide and silver ovide. No. 2,442,131. Kenneth K. Kearby (to Standard Oil Development Co.).

Two-stage alkylation with olefin streams containing propylene and ethylene in the presence of aluminum bromide. No. 2,442,160. Charles Ovid Baker (to Socony-Vacuum Oil Co., Inc.).

Alkylation-recycling of alkylate product stream free of inert gases. No. 2,442,221. Ashley R. Sydnor, Jr. (to Standard Oil Development Co.)

Conversion of hydrocarbons. No. 2,442,276. Theodore W. Nelson and Henry D. Noll and Thomas P. Simpson (to Socony-Vacuum Oil Co., Inc.).

Dehydrogenating an olefine having at least 4 carbon atoms in a carbon chain containing the olefinic linkage, by passing the olefine together with steam through a catalyst composed of a normal metal phosphate material combined with calcium and nickel. No. 2,442,319. Edgar C. Britton and Andrew J. Dietzler (to The Dow Chemical Co.).

Dehydrogenation of monoolefins to diolefins catalyzed by calcium nickel phosphate-chromium oxide composite. No. 2,442,320. Edgar C. Britton and Andrew J. Dietzler (to The Dow Chemical Co.).

Isomerization of normal paraffin hydrocarbons by contact with aluminum chloride supported on a metal halide. No. 2,442,418. John W. Latchum, Jr. and Armand D. Pickett and Gerald B. Evans (to Phillips Petroleum Co.).

Manufacture of gasoline. No. 2,442,440. Loren P. Scoville (to The Texas Co.).

Regenerating HF catalyst in an alkylation process. No. 2,442,666. Emory M. Skinner, Robert E. Redfield, and John C. Bolinger (to Socony-Vacuum Oil Co., Inc.).

Conversion of hydrocarbons by contacting hydrocarbon vapor with a catalyst consisting of silica impregnated zirconia gel. No. 2,442,772. Milton M. Marisic and Edward M. Griest (to Socony-Vacuum Oil Co., Inc.).

Avoiding emulsification difficulties and promoting the separation of the raffinate phase from the extract phase in the selective solvent extraction of viscous hydrocarbon oil employing nitrobenzene as the extraction solvent by adding an oil-soluble alkaline earth metal sulfonate. No. 2,442,820. Darwin M. McCormick (to Atlantic Refining Co.).

Process for the alkylation of an aromatic compound. No. 2,442,878. Louis Schmerlin and Vladimir N. Ipatieff (to Universal Oil Products Co.).

Mineral oil composition comprising a viscous mineral oil fraction, an oil-soluble metal salt, selected from the group con-

sisting of metal sulfonates and metal carboxylates, and an oil-soluble phosphorus- and sulfur- containing reaction product obtained by reaction of phosphorus pentasulfide and oleyl alcohol. No. 2,442,915. Henry G. Berger and Everett W. Fuller (to Socony-Vacuum Oil Co.).

Desulfurizing hydrocarbons by contacting with lead aluminosilicate. No. 2,442,982. Frederick C. Nachod (to The Atlantic Refining Co.).

Lubricant of low pour point comprising a synthetic lubricant having incorporated an ester of an alkyl-substituted phenol, said synthetic lubricant being prepared from a crystalline paraffin wax and toluene by: partially halogenating the paraffin wax to form a mixture of halogenated wax and substantially unhalogenated wax; mixing the halogenated wax and unhalogenated wax with toluene; adding a catalyst capable of effecting a Friedel-Crafts type condensation; heating until the halogenated wax has reacted with said toluene. No. 2,443,082. Orland M. Reiff, Howard D. Hartough, and Harry J. Andress, Jr. (to Socony-Vacuum Oil Co.).

Lubricant of low pour point comprising a synthetic lubricant and an ester of an alkyl-substituted phenol. No. 2,443,083. Orland M. Rieff, Howard D. Hartough, and Harry J. Andress, Jr. (to Socony-Vacuum Oil Co.).

A method of converting hydrocarbons which comprises introducing divided catalyst particles and hydrocarbons into a reaction zone, forming a relatively dense dry fluidized mixture, introducing stripping gas into the bottom portion to remove hydrocarbon vapors from the fouled catalyst. No. 2,443,190. Robert W. Krebs (to Standard Oil Development Co.).

Isobutylene purification from a mixture of saturated and unsaturated hydrocarbons by contacting with sulfuric acid. No. 2,443,245. Henry J. Hibshman (to Standard Oil Development Co.).

Compounded lubricating oil. No. 2,443,264. Louis A. Mikeska (to Standard Oil Development Co.).

Breaking water-in-oil emulsions by adding the salt of the reaction between a petroleum sulfonate and an organic amine. No. 2,443,273. Richard A. Salathiel (to Standard Oil Development Co.).

Catalytic reforming of hydrocarbons by subjecting the hydrocarbon under dehydrogenating conditions to the action of a catalyst prepared by forming a suspension of a wet alumina hydrogel in an aqueous solution of a water-soluble compound having a volatile cation and an acid radical containing a metal whose oxide possesses dehydrogenating activity. No. 2,443,285. Glenn M. Webb and Marvin A Smith (to Universal Oil Products Co.).

Catalytic conversion of hydrocarbons by continuously flowing by gravity a continguent fluent hot mass of active catalyst pellets through a series of substantially vertically extending zones. No. 2,443,337. Louis Joe Weber (to Phillips Petroleum Co.).

Cyclic process for the endothermic catalytic conversion of hydrocarbons by contact with a mass of contact catalyst. No. 2,443,402. Walter A. Schulze (to Phillips Petroleum Co.).

Production of isoparaffins by contacting normal paraffin feedstock with a catalyst prepared by fusion together of a mixture of anhydrous aluminum halide and an hydrated aluminum halide. No. 2,443,418. Eric William Muster Fawcett and Eric Sylvester Narracott (to Anglo-Iranian Oil Co. Limited).

Cracking hydrocarbon in presence of trimethylene chlorobromide. No. 2,443,497. Hillis O. Folkins (to The Pure Oil Co.).

Wax-oil separation with dehydration of solvent. No. 2,443,532. Clyde H. O. Berg (to Union Oil Co. of Calif.).

Canadian

Lubricating oils and greases containing a viscosity improving amount of interpolymerization products of styrene and a mixture containing unsaturated hydrocarbons obtained by cracking paraffin wax. No. 449,361. Mathias Pier and Friedrich Christmann (to I. G. Farbenindustrie Aktiengesellschaft to Jasco, Inc.).

Producing valuable lubricant addition agents by heating an unsaturated terpenic compound with a phosphorus halide. No. 449,395. Arnold J. Morway and John C. Zimmer (to Standard Oil Development Co.).

Lubricating concentrate comprising rosin materials, sulphur and mineral lubricating oil. No. 449,404. Ralph A. Potter (to Union Oil Co. of California).

Producing high octane number motor fuel by thermal and non-catalyctical cracking. No. 449,542. Ernest W. Thiele, George E. Schmitkons and Carl Max Hull (to Standard Oil Co.).

Mineral lubricating oil containing an oil-soluble metal soap of the condensation product of formaldehyde with an alky phenol. No. 449,549. Chester E. Wilson (to Union Oil Co.).

Reforming petroleum distillate. No. 449,625. Kenneth M. Thompson (to The Atlantic Refining Co.).

Recovery and utilization of low-boiling isoparaffins from alkylation products. No. 449,690. Prentiss Lobdell and George L. Mateer (to Standard Oil Development Co.).

Two-stage alkylation process. No. 449,691. Charles E. Morrell (to Standard Oil Development Co.).

Low temperature alkylation. No. 449,692. Hans G. Vesterdal and Richard N. Meinert (to Standard Oil Development Co.).

Continuous method of producing liquid motor fuels from coal. No. 449,868. Walter G. Scharmann and Frank T. Barr (to Standard Oil Development Co.).

Process of removing copper from hydrocarbon liquids comprising contacting a liquid hydrocarbon, containing copper as a colloidal impurity, with sand which is polarized by a high tension source of direct electric current. No. 449,923. Robert Bowling Barnes and Garnet Philip Ham (to American Cyanamid Co.).

Removing metallic substances from hydrocarbon liquids by contacting a liquid hydrocarbon containing metallic substances with fine particles of an anion active resin. No. 449,924. Garnet Philip Ham and Robert Bowling Barnes (to American Cyanamid Co.).

Solvent extraction process for mineral oil which employs a selective solvent. No. 450,166. Joseph J. Savelli and John M. Powers (to Standard Oil Development Co.).

Increasing the usefulness of solid isomerization catalyst masses by contacting at least one normal paraffin in the vapour phase under isomerization reaction conditions, in the presence of a porous sorptive carrier while introducing into the catalyst mass aluminum halide vapours. No. 450,167. Norval F. Myers (to Standard Oil Development Co.).

Recovering hydrocarbon oil from solid minerals by heating. No. 450,168. Clarke T. Harding (to Standard Oil Development Co.).

Shale distillation by providing a fluidized mass of the shale in a distillation zone and withdrawing hydrocarbon vapours. No. 450,331. Forrest H. Blanding (to Standard Oil Development Co.).

Producing alkylated aromatic hydrocarbons by contacting an aromatic hydrocarbon and an olefinic hydrocarbon with a catalyst comprising a readily reducible pyrophosphate. No. 450,339. Raymond E. Schaad (to Universal Oil Products Co.).

Manufacture of diolefins by subjecting mono-olefins under dehydrogenating conditions to the action of a solid catalyst comprising a compound selected from the class consisting of titanium, zirconium, cerium, hafnium and thorium. No. 450,340. Jacque C. Morrell (to Universal Products Co.).

Producing alkylated aromatic compounds by reacting an aromatic compound and an olefinic hydrocarbon under alkylating conditions in the presence of a catalyst containing as its active ingredient a material formed by calcining cupric orthophosphate. No. 450,341. Louis Schmerling and Vladimir N. Ipatieff (to Universal Oil Products Co.).

Photographic

Photographic material comprising a silver halide gelatin emulsion in contact with a member of the group consisting of a sulfinic acid, a seleninic acid and their salts, and a polysulfide compound selected from the group consisting of aromatic and heterocyclic polysulfide compounds. No. 2,440,110. Fritz W. H. Mueller (to General Aniline & Film Corporation).

Sensitized pyrogallol reagent. No. 2,440,315. Richard L. Tuve.

Silver halide emulsions sensitized by mixtures of high polyalkylene glycols and low polyhydric alcohols. No. 2,441,389. Ralph Kingsley Blake (to E. I. du Pont de Nemours & Company).

A colloid silver halide emulsion containing a silver halide and a condensation product of an aliphatic aldehyde with a base taken from the group consisting of ammonia and primary amines. No. 2,441,440. Postell M. Nicholes and James Harold Taylor (to E. I. du Pont de Nemours & Company).

Developing a reducible silver salt image in a photographic element by means of an aromatic primary amino developing agent. No. 2,441,491. John David Kendall and Douglas James Fry (to Ilford Limited).

A carrier having a light sensitive layer comprising a diazo compound, a coupling component, a weak organic acid, boric acid and a material selected from the group consisting of phosphoric acid and its soluble primary salt. No. 2,442,061. Sam Charles Slifkin (to General Aniline & Film Corp.).

Process for developing multilayer film containing color formers. No. 2,442,930. Herbert W. Morreall, Jr. (to General Aniline & Film Corp.).

Photographic elements containing 1,3,4-triazaindolizine cyanine dyes. No. 2,443,136. Newton Heimbach (to General Aniline & Film Corp.).

Light-sensitive photographic element comprising a support having thereon a silver halide emulsion layer containing an ultra-violet-light-absorbing amount of benzal pyruvic acid. No. 2,443,157. Edward Philip Davey and Edward Bowes Knott (to Eastman-Kodak Co.).

Canadian

Colour-yielding photographic element comprising at least one layer composed of a hydrophilic mixed butyloxymethylphenylpyrazolonoxymethyl polyamide which has attached to recurring amide nitrogen atoms one phenylmethylpyrazolonoxymethyl group for each eight amide groups, said layer having light-sensitive silver halides dispersed therethrough. No. 449,273. David Malcolm McQueen (to Canadian Industries, Ltd.).

Photographic element comprising a transparent base bearing at least two differentially sensitized silver halide emulsion layers. No. 449,282. Otis Willard Murray (to Canadian Industries Ltd.).

A photographic element, a light-sensitive silver halide emulsion layer having in intimate contact therewith a polyalkylene glycol. No. 449,283. Ralph Kingsley Blake, William Alexander Stanton and Ferdinand Schulze (to Canadian Industries Ltd.).

Forming a sensitive photographic layer capable of producing a coloured image by precipitating a silver halide in a solution of a water-insoluble resin containing a colour former suspending particles of the solution of resin containing silver halide and colour former in gelatin and coating the suspension on a support. No. 449,284. Michele Martinez (to Canadian Kodak Co. Ltd.).

Photographic element containing trinuclear cyanine dye bases. No. 449,662. Alfred W. Anish (to General Aniline & Film Corp.).

Radiation-sensitive element comprising a support-bearing a water-permeable colloid layer containing an N-aryl-nitrone. No. 449,812. David Malcolm McQueen (to Canadian Industries Ltd.).

Colour-forming photographic developer comprising an aromatic primary amino developing agent and 1,1'-methyl-misthiobarbituric acid. No. 449,834. Fritz W. H. Mueller and Abraham Bavley (to General Aniline & Film Corp.).

Colour-forming photographic developer comprising an aromatic primary amino developing agent and 2-(4'-dimethylamino-6'-sulphobenzal)-thiobarbituric acid. No. 449,835. Fritz W. H. Mueller and Abraham Bavley (to General Aniline & Film Corp.).

Photographic elements containing trinuclear iminol cyanine dyes and the hydroxy heavy metal salts thereof. No. 449,836. Alfred W. Anish (to General Aniline & Film Corp.

Polymers

Resin from phenol, formaldehyde, saturated and unsaturated hydrocarbons, and rosin. No. 2,439,824. Fritz Rostler and Leopold Bornstein (to Wilmington Chemical Corporation).

A liquid cyclic polymer of dimethyl silicone having the formula $[(CH_3)_2SiO]_n$, where n represents an integer from 5 to 7 inclusive. No. 2,439,856. Rob Roy McGregor and Earl Leathen Warrick (to Corning Glass Works).

A laminated member comprising a plurality of sheets of fibrous material and a binder for the sheet of fibrous material con-

sisting of the resinous reaction product of a vinyl aryl compound selected from the group consisting of styrene, alpha methyl styrene, and monohalide and monoalkyl nuclear substituted styrene and the soluble ester reaction product of an unsaturated alpha-beta ethylenic dicarboxylic acidic compound selected from the group consisting of maleic anhydride, maleic acid, fumaric acid, citraconic acid and citraconic anhydride, with castor oil. No. 2,439,953. Jack Swiss and Newton C. Foster (to Westinghouse Electric Corporation).

Interpolymer of an alpha-methylene carboxylic acid fluoride selected from the group consisting of acrylyl and methacrylyl fluorides with methyl methacrylate. No. 2,440,090. Benjamin W. Howk and Ralph A. Jacobson (to E. I. du Pont de Nemours & Company).

Monomeric products formed by the addition of equimolecular proportions of (a) acrylonitrile and (b) a compound from the class consisting of drying oil fatty acids having conjugate olefinic bonds and esters of said acids and alcohols having the alcoholic hydroxyl group as the sole reactive functional group thereof. No. 2,440,140. Herman A. Bruson and Warren D. Niederhauser (to The Resinous Products & Chemical Company).

Process of fabricating non-porous, homogeneous **articles of polytetrafluoroethylene.** No. 2,440,190. Johannes Alfthan (to E. I. du Pont de Nemours & Company).

Process of decolorizing gum rosin. No. 2,440,204. William Burns Logan.

Polymer of a compound represented by the general formula R. ODCOOR, wherein R_1 and R_2 are allyl groups and D is a divalent saturated unsubstituted hydrocarbon radical of 1 to 17 carbon atoms. No. 2,440,237. David E. Adelson and Hans Dannenberg (to Shell Development Company).

Solution polymerization of methyl methacrylate. No. 2,440,256. Henry Dreyfus, Claude Bonard (to Celanese Corporation of America).

Interpolymerization of isoamylenes with normal butenes and isobutene. No. 2,440,286. Summer H. McAllister (to Shell Development Company).

Production of Polymerised polymethyl methacrylate from a mixture containing hydrogen peroxide. No. 2,440,318. Francis Thomas White and Arthur John Daly (to Celanese Corporation).

Dehydrating water-containing liquids which normally foam excessively on ebullition in the presence of a liquid low-volatility polymer of a chloro-fluoro olefin monmer. No. 2,440,489. Raphael Rosen and John C. Zimmer (to Standard Oil Development Company).

Polymerization process for butadiene with methallyl chloride. No. 2,440,494. William J. Sparks and Robert M. Thomas (to Standard Oil Development Company).

Solid methyl methacrylate polymer with improved surface characteristics by applying a coating solution comprising ethyl silicate and a polyvinyl butyral resin. No. 2,440,711. Max Fredrick Bechtold (to E. I. du Pont de Nemours & Company).

Producing molded products from resin bearing vegetable shell material. No. 2,440,789. Edward Van der Pyl (to Agicide Laboratories, Inc.).

A compound of the formula $X—(CH_2—CH_2)n—CX_3$ wherein X is halogen of the class consisting of chlorine, bromine and iodine and n is an integer greater than unity. No. 2,440,800. William E. Hanford and Robert M. Joyce, Jr. (to E. I. du Pont de Nemours & Company).

Preparing liquid to solid compounds having a chain containing a plurality of bivalent recurring units corresponding to a polymerizable compound having an ethylenic double bond, the two terminal valences of the chain being satisfied by H—and Cl—radicals respectively. No. 2,440,801. William E. Hanford and Jesse Harmon (to E. I. du Pont de Nemours & Co.).

The process of polymerizing in granular form a monomeric, water-insoluble, polymerizable ethenoid material dispersed in water. No. 2,440,808. Harry T. Neher and Frank J. Glavis (to Rohm & Haas Company).

Vinyl resin composition containing polyvinyl chloride and a copolymer of vinyl chloride and vinyl acetate and an alkenyl succinic acid. No. 2,440,985. Leslie T. Sutherland (to Allied Chemical & Dye Corporation).

Manufacture of a dicyanodiamide condensation product from dicyanodiamide and formaldehyde with an ammonium salt of a strong mineral acid, and then condensing the product formaldehyde. No. 2,440,988. Jules Treboux and Ricardo Bellvila (to J. R. Geigy).

Process for obtaining a silicon-containing product comprising reacting a substance which contains a plurality of alcoholic hydroxyl groups attached to a hydrocarbon residue, with a hydrocarbon silicanehalide having the formaula $R\ SiX_{n}^{4—n_1}$, where n is a positive integer of from 1 to 3, X is halogen, and R is a hydrocarbon radical. No. 2,441,066. William E. Hanford (to E. I. du Pont de Nemours & Company).

Production of a polymeric substance by heating polymethyl methacrylate with a drying oil diglyceride. No. 2,441,068. Donald Helmsley Hewitt and Frank Armitage.

Thermosetting formaldehyde-treated monoolefin/carbon monoxide polymers. No. 2,441,082. Paul Swithin Pinkney (to E. I. du Pont de Nemours & Company).

Making nylon fabrics elastic by treatment with formaldehyde. No. 2,441,085. Allan K. Schneider (to E. I. du Pont de Nemours & Company).

Methyl siloxane polymers by hydrolyzing a mixture consisting of silanes of the general formulae $(CH_3)_2Si(OR)_2$ and $(CH_3)_3SiOR$ where R is an alkyl radical. No. 2,441,098. James Franklin Hyde (to Corning Glass Works).

A monomeric polyfluorocyclobutane. No. 2,441,128. Paul L. Barrick and Richard D. Cramer (to E. I. du Pont de Nemours & Company).

Plastic composition comprising polyvinyl chloride, vinyl chloride-vinyl acetate copolymer, and polyvinyl butyral, and as a plasticizer therefor a hexitan tetra-ester of which the acyl radicals are all selected from the group consisting of acyl radicals of the saturated straight-chain aliphatic acids with from 2 to 8 carbon atoms, there being not over 2 acetyl groups in the ester and the total number of carbon atoms in the four acyl groups being at least 12. No. 2,441,241. Rudolph M. Goepp, Jr. (to Atlas Powder Co.).

An organosiloxane consisting of siloxane units which correspond to the general formulae $RR'R''SiO_{1/2}$ and SiO_2, where R, R′ and R″ are monovalent hydrocarbon radicals which are attached to the silicon through carbon-silicon linkages, in which organosiloxane there are at least 2 units of the type $RR'R''SiO_{1/2}$ per 3 units of the type SiO_2 but not more than 4 of the former per one of the latter, and in which organosiloxane all the valences of the silicon atoms other than those satisfied by the R,R′ and R″ radicals are satisfied by the oxygen atoms of said units, which oxygen atoms are each bonded to two of said silicon atoms. No. 2,441,320. James Franklin Hyde (to Corning Glass Works).

Process of treating vinyl chloride-containing polymers subject to thermal decomposition under heat processing conditions with an N-chlorohydantoin. No. 2,441,360. Charles G. Kamin (to E. I. du Pont de Nemours & Company).

Insolubilizing hydrolyzed polyvinly acetate by immersing in an excess of an unsaturated aldehyde. No. 2,441,470. Thomas S. Carswell (to Monsanto Chemical Company).

An interpolymerizate of a styrene selected from the class consisting of styrene, nuclear-methyl-substituted styrenes and nuclear-chlorine-substituted styrenes, in which the vinyl group is intact, a compound of the formula $CH_2=C(R)—CO—O—CH_2—C(R)=CH_2$ where R is a radical selected from the class consisting of hydrogen, methyl, ethyl, and chlorine, and an allylic alcohol. No. 2,441,515. Robert H. Snyder (to U. S. Rubber Co.).

An acetone-soluble interpolymerizate of an allylic acrylate of the formula $CH_2=C(R)—CO—O—CH_2—C(R)=CH_2$ where each R is a radical selected from the class consisting of hydrogen, methyl, ethyl, and chlorine, and an allylic alcohol. No. 2,441,516. Robert H. Snyder (to United States Rubber Company).

Preparing a polypentaerythritol comprising adding to an aqueous solution containing pentaerythritol, sodium hydroxide and formaldehyde, acetaldehyde and sufficient formaldehyde to make the ratio of total formaldehyde to acetaldehyde between 4½ and 5 to 1. No. 2,441,597. John P. Remensnyder, Philip L. Bowman and Robert H. Barth (to Heyden Chemical Corp.).

Interpolymer of diallyl fumarate and modified unsaturated alkyd resin. No. 2,441,799. Gaetano F. D'Alelio (to General Electric Co.).

Accelerated curing of phenol-form-aldehyde resins to the infusible state with 3,5-xylenol. No. 2,441,860. Richard R. Whetstone (to Shell Development Co.).

Production of a polypentaerythritol by reaction of acetaldehyde, formaldehyde, sodium hydroxide and pentaerythritol. No. 2,441,944. John P. Remensnyder, Philip I. Bowman, and Robert H. Barth (to Heyden Chemical Corp.)

Polyvinyl butyral resin composition. No. 2,442,018. Richard W. Quarles (to Carbide and Carbon Chemical Corp.).

Composition of matter exhibiting a substantial lack of nerve comprising a solid, elastic, polymerized methyl-substituted polysiloxane obtained by condensing a liquid polymeric dimethylsiloxane and a solid rubbery, hydro-carbon polymeric product of polymerization of a mass comprising, an isomonoolefin having less than 8 carbon atoms per molecule and a minor proportion of conjugated diolefin having from 4 to 8 carbon atoms per molecule. No. 2,442,059. Moyer M. Safford (to General Electric Co.).

Thermal copolymer of a drying oil selected from the class consisting of vegetable and marine oils and polychloroprene. No. 2,442,085. Curtis E. Huff and James H. Clynch (to United States Rubber Co.).

Thermal copolymer of a vegetable drying oil with butadiene-1,3-styrene copolymer rubber. No. 2,442,086. Curtis E. Huff and James H. Clynch (to United State Rubber Co.).

Preparing an organo-silicon resinous material from a mixture of organo-silicon halides consisting of dimethyl silicon dichloride, phenyl silicon trichloride, and diphenyl silicon dichloride. No. 2,442,212. Eugene G. Rochow (to General Electric Co.).

In the processing of a low temperature interpolymer of a major proportion of isobutylene with a minor proportion of a conjugated diolefin, the step of treating the polymer with a sulfur chloride, withdrawing hydrogen chloride and thereafter milling the material to incorporate thereinto carbon black, zinc oxide, stearic acid, sulfur and a sulfurization aid. No. 2,442,218. William J. Sparks and Robert M. Thomas (to Jasco, Inc.).

A co-polymer of vinylfurane and styrene. No. 2,442,283. Walter Bock (to General Aniline & Film Corp.).

Infusible, insoluble polymer consisting of a **linear polyvinyl ester** and an organic peroxide. No. 2,442,330. Calvin S. Fuller (to Bell Telephone Laboratories, Inc.).

Plasticized copolymers of compounds containing a single $CH_2=C$ group and diesters of ethylene alpha beta dicarboxylic acids. No. 2,442,558. Gaetano F. D'Alelio (to Pro-phy-lac-tic Brush Co.).

Copolymer of acrylate ester, acrylonitrile, and a diene-1,3. No. 2,442,588. Gaetano F. D'Alelio (to General Electric Co.).

Polymerizing propylene by catalyzing said polymerization with boron fluoride and a polymerization actiivator comprising sulfur dioxide. No. 2,442,643. William E. Elwell and Richard L. Meier (to California Research Corp.).

In a process of polymerizing normal mono-olefins in the presence of boron fluoride, the step of controlling the viscosity by incorporation of sulfur dioxide. No. 2,442,644. William E. Elwell and Richard L. Meier (to California Research Corp.).

Process of manufacturing hydrocarbon polymer which comprises forming a solution of a mono-olefin in liquid sulfur dioxide, catalyzing polymerization of said olefin by a halide polymerization catalyst capable of forming a coordination compound with liquid sulfur dioxide, forming a sulfur dioxide-insoluble hydrocarbon polymer phase, separating and recovering polymer from said separated sulfur dioxide-insoluble polymer phase. No. 2,442,645. William E. Elwell and Richard L. Meier (to California Research Corp.).

Preparing hard, tough, resinous products by condensing a carbamide from the group consisting of urea, thiourea, and guanidine, an aldehyde from the group consisting of formaldehyde, acetaldehyde, benzaldehyde and fufuraldehyde, and an unsaturated acylic-alcohol from the group consisting of allyl alcohol and methallyl alcohol. No. 2,442,747. Robert W. Auten and William L. Evers (to The Resinous Products & Chemical Co.).

Producing molded articles of resinified densified wood comprising soaking comminuted wood in unreacted aqueous formaldehyde urea solution containing an excess of urea. No. 2,442,897. William Karl Loughborough (to U. S. A. as represented by the Secretary of Agriculture).

Condensation product of ethylene sulfide and guanyl-urea. No. 2,442,957. Leonard P. Moore and Walter P. Ericks (to American Cyanamid Co.).

Polymeric reaction product from trimethyladipic acid and an amine of the general formula $H_2N\text{-}CH_2\text{-}R\text{-}CH_2NH_2$ wherein R is a divalent hydrocarbon radical selected from the group consisting of alkyl and aryl radicals. No. 2,442,958. Rupert C. Morris and Hans Dannenberg and Harry de V. Finch (to Shell Development Co.).

Forming a copolymer of unsaturated glyceride oil and a hydrocarbon of a class consisting of cyclopentadiene and lower polymers thereof up to the pentamer. No. 2,443,044. William H. Lycan and Howard L. Gerhart (to Pittsburgh Plate Glass Co.).

Copolymer of a mixture of vinyl acetate and a compound having the formula $R_2CH{=}CR_1{-}CHX_2$ X being a substituent selected from the group consisting of chlorine and bromine and R_1 and R_2 being substituents selected from the group consisting of hydrogen, alkyl and aryl. No. 2,443,167. Louis M. Minsk and William O. Kenyon (to Eastman Kodak Co.).

Production of readily polymerizable vinyl aromatic compounds by passing a vapor mixture comprising an alkylated aromatic compound and a minor amount of a polymerization inhibitor through a reaction zone. No. 2,443,217. James L. Amos and Frederick J. Soderquist (to Dow Chemical Co.).

Polymerization catalyst consisting of a C_3 to a C_4 saturated aliphatic hydrocarbon solution of an aluminum bromo chloride. No. 2,443,287. David W. Young and Norman W. Elmore (to Standard Oil Development Co.).

Plasticized urea-formaldehyde resin having minor proportion of an alkali lactate. No. 2,443,368. James Ranald Alexander, Donald Burton, and Frederic Hausmann (to William Walker and Sons Limited).

Flexible article coated with a film of N-alkoxymethyl polyamide which comprises the reaction product of a mixture of formaldehyde and an alcohol in the presence of an acid selected from the group consisting of formic acid and phosphoric acid, with a synthetic linear polyamide. No. 2,443,450. Boynton Graham and Howard S. Turner (to E. I. DuPont de Nemours & Co.).

Making N-methylol polyamides by heating formaldehyde and a fiber-forming polycarbonamide. No. 2,443,486. William Way Watkins (to E. I. DuPont de Nemours & Co.).

Dihydropyran copolymers of at least 1% by weight of dihydropyran and at least 50% by weight of a vinyl ester of a carboxylic acid. No. 2,443,496. Nestor Winston Flodin (to E. I. DuPont de Nemours & Co.).

Producing lignin resins by mixing one part of lignin produced by hydrolysis of woody material with at least one part of abietic acid. No. 2,443,576. Eduard Farber (to Timber Engineering Co.).

Canadian

Method of extruding polymerized derivatives of methacrylic acid. No. 449,251. Walter Eastby Lawson and Carl Buel Van Winter (to Canadian Industries Ltd.).

Moulding composition which comprises a copolymer of methyl methacrylate with a compound from the group consisting of styrene and vinyl acetate and polyvinyl acetal resin. No. 449,252. Maurice Leon Macht (to Canadian Industries Ltd.).

Polymer obtained by polymerization of a conjugated butadiene with a mononitro alkanol diester of an alpha ethylenically-unsaturated, alpha, betadicarboxylic acid. No. 449,256. Charles Joseph Mighton (to Canadian Industries Ltd.)

A polymerizate of an alpha, beta-ethylenically unsaturated aliphatic carboxylic acid ester of an alpha-cyanoalcohol with a polymerizable conjuated butadiene. No. 449,259. Jesse Harmon and Charles J. Mighton (to Canadian Industries, Ltd.).

Polyvinyl halide composition containing chlorinated paraffin wax. No. 449,260. Ernest Francis Brookman and Stephen Frederick Pearce (to Canadian Industries Ltd.).

Thermoplastic polyvinyl chloride, chlorinated paraffin wax, plasticizer composition. No. 449,261. Ernest Francis Brookman and Stephen Frederick Pearce (to Canadian Industries, Ltd.).

Heating alkali refined linseed oil and low-viscosity, low-hydroxyl polyvinyl butyral until the mixture is compatible. No. 449,268. Burt Carlton Pratt (to Canadian Industries, Ltd.).

Vinyl fluoride copolymer with a terminally unsaturated olefin. No. 449,269. Donald Drake Coffman and Thomas Aven Ford (to Canadian Industries, Ltd.).

Stable dispersion of partially polymerized hydrophobic trimethylol melamine resin consisting of said resin, glycerol, hydroxy acetic acid and water. No. 449,278. Gilbert Pitzl (to Canadian Industries, Ltd.).

Hydrolyzed interpolymer of isobutylene with vinyl acetate. No. 449,281. Carleton Angelo Sperati (to Canadian Industries Ltd.).

Bearing comprising a solid polymerized carbon fluoride. No. 449,319. Charles F. Hill (to Canadian Westinghouse Co., Ltd.).

Polymerizing sugars by incorporating with the sugar, as a catalyst, a neutral metal salt, and heating the sugar under substantially anhydrous conditions. No. 449,331. Gerald J. Leuck (to Corn Products Refining Co.).

A safety-glass unit comprising two juxtaposed glass sheets and an intermediate film consisting of a member of the class of polyvinyl alcohol, derivatives thereof which are soluble in or swelled by water and plastic compositions containing one or more of these substances, wherein the bond is secured by an adhesive comprising a member of the class consisting of the inorganic salts and organic esters of silicic acid. No. 449,540. Emile Clement Cottet and René Louis Fernand Chazal (to Société des Usines Chimiques Rhone-Poulenc).

Depolymerisation of polystyrene which consists in subjecting the polystyrene to a rapid heating of short duration. No. 449,648. Thomas Bruce Philip, Herbert Muggleton Stanley and William Laurence Wood (to The Distillers Co. Ltd.).

Plastic composition comprisin a resin selected from the group consisting of polyvinyl chloride, polyvinyl chloride-acetate, and polyvinyl butyral, and as a plasticizer therefor a hexitan tetra-esters. No. 449,785. Rudolph Max Goepp, Jr. (to Atlas Powder Co.).

Polymerizing ethylene in the presence of benzoyl peroxide catalyst. No. 449,795. William Edward Hanford (to Canadian Industries Ltd.).

Polymerizing ethylene in the presence of molecular oxygen of a peroxy compound catalyst. No. 449,797. Alfred Theodore Larson (to Canadian Industries Ltd.).

Producing ethylene polymers by heating ethylene in the presence of alkyl and aryl lithium compounds as the sole catalyst with ethylene containing less than 1000 parts per million of oxygen. No. 449,798. William Edward Hanford, John Richard Roland and Howard Sargent Young (to Canadian Industries Ltd.).

Continuous process for polymerizing ethylene in the presence of a catalyst selected from the group consisting of oxygen and substances yielding oxygen under the reaction conditions, water, and a material selected from the group consisting of benzene and chlorbenzene. No. 449,799. Alfred Theodore Larson and Norman William Krase (to Canadian Industries Ltd.).

Interpolymers of isobutylene with an alkyl acetylene. No. 449,801. Denis William Huebner and James Edgar Fearey (to Canadian Industries, Ltd.).

Polymerizing ethylene in the presence of free oxygen, water and an alkali. No. 449,802. Merlin Dewey Peterson (to Canadian Industries Ltd.).

Fractionation of solid polymers of ethylene by condensing out the polymer from solution in the ethylene at 1000 atmospheres and 200° C. lowering the temperature to 125° C. while maintaining the pressure at 1000 atmospheres, and separating the polymer condensed out at that temperature. No. 449,803. Norman William Krase (to Canadian Industries Ltd.).

Preparation of normally semi-solid to solid polymers of ethylene in the presence of a catalyst selected from the group consisting of peroxy compounds and molecular oxygen. No. 449,804. Norman William Krase and Allen Everett Lawrence (to Canadian Industries Ltd.).

Polymerization of ethylene in the presence of a catalyst selected from the group consisting of oxygen and peroxy catalysts. No. 449,805. Crawford Hallock Greenwalt (to Canadian Industries Ltd.).

Continuous process for the preparation of interpolymers of ethylene and vinyl acetate. No. 449,806. Lombard Squires (to Canadian Industries Ltd.).

Fabrication of polytetrafluorethylene articles. No. 449,811. Johannes Alfthan and John Lyman Chynoweth (to Imperial Chemical Industries Ltd.).

Polymerization of ethylene by conducting the polymerization in the presence of an alkyl hydroperoxide. No. 449,813. Milton John Roedel (to Canadian Industries Ltd.).

Chlorinated polythene containing from 0.1 to 5.0 per cent of sodium lactate. No. 449,841. Donald Whittaker (to Canadian Industries Ltd.).

Bonding of polythene compositions to surfaces which comprises the steps of cementing a layer of asbestos of such thickness that the cement does not penetrate throughout said layer and thereafter covering said asbestos layer with an adherent film of polythene composition. No. 449,842. George Crawford Tyce (to Imperial Chemical Industries Ltd.).

Insoluble and infusible polymerized diallyl ester of a polycarboxylic acid selected from the group consisting of fumaric acid, sebacic acid, succinic acid, adipic acid and phthalic acid. No. 449,921. Theodore F. Bradley (to American Cyanamid Co.).

Process of preparing an insoluble and infusible solid which comprises mixing an ester selected from the group consisting of diallyl fumarate, diallyl sebacate, diallyl succinate, diallyl adipate and diallyl phthalate with a drying oil material selected from the group consisting of drying oils, alkyd resins modified with drying oils, alkyd resins modified with drying oils and drying oil acids, and heating. No. 449,922. Theodore F. Bradley (to American Cyanamid Co.).

Production of viscous aqueous alkaline solutions of vegetable globulins for extrusion in the manufacture of filamentary products which comprises including in the unmatured aqueous alkaline solutions of vegetable globulins an alkali metal sulphite. No. 449,993. Walter Anderson Caldwell (to Imperial Chemical Industries Ltd.).

Plastic composition obtained by heating a rubber-like polymer of chlor butadiene with crude tolyl dichlor phosphine. No. 450,140. George Dewey Martin (to Monsanto Chemical Co.).

Recovery of petroleum resins by treating with a phenolic solvent adding water and separating. No. 450,165. Raymond L. Betts (to Standard Oil Development Co.).

Vinyl resin composition comprising an intimate solid dispersion of an aluminum hydrate with a conjoint polymer of vinyl chloride with vinyl acetate. No. 450,274. Lauchlin M. Currie (to Carbide and Carbon Chemical Ltd.).

Finishing an isobutylene polymer by separating from a liquified normally gaseous medium. No. 450,328. Carll F. Van Gilder and Hector C. Evans (to Standard Oil Development Co.).

Processes and Methods

Process for continuously effecting chemical conversions involving contacting a gas with a solid material. No. 2,439,811. Joseph W. Jewell (to The M. W. Kellogg Company).

Separating particles of coal from a mixture thereof with particles of heavy refuse, which comprises forming an aqueous suspension of finely divided crystalline limestone adjusting and maintaining the density at such a value that the coal particles float on said bath but the particles of heavy refuse sink. No. 2,440,005. Jean Albert Brusset (to McNally Pittsburg Manufacturing Corporation).

Process and apparatus for continuous catalysis. No. 2,440,475. Virgil V. Jacomini.

Process and apparatus for contacting fluids with powdered solids. No. 2,440,482. Homer Z. Martin (to Standard Oil Development Company).

Contacting solids and gaseous fluids. No. 2,440,620. Wilfred O. Taff (to Standard Oil Development Company).

Transferring finely divided solids. No. 2,440,623. Vanderveer Voorhees (to Standard Oil Company).

Method and apparatus for contacting gases and particle form solid material. No. 2,441,311. John A. Crowley, Jr. and Charles V. Hornberg (to Socony-Vacuum Oil Company).

Method and apparatus for contacting gases and solids. No. 2,441,335. Edward L. Sinclair (to Socony-Vacuum Oil Company).

Pulverizing solid material and simultaneously chemically reacting said material at high temperatures. No. 2,441,613. Ladislaus Balassa.

Method and apparatus for operations with a contact mass. No. 2,441,724. Thomas P. Simpson (to Socony-Vacuum Oil Co.).

Extraction process using a dicyanoether. No. 2,441,827. Art McKinnis (to Union Oil Co. of California).

Method of recovering liquid phthalic anhydride which comprises passing crude phthalic anhydride vapors through a condensing chamber wherein phthalic anhydride crystals will be

formed, stopping said flow of gas, impinging onto a mass of such crystals molten phthalic anhydride heated to a temperature sufficiently above its melting point to supply heat of fusion and draining. No. 2,441,873. Charles R. Downs.

Method of removing asphalt emulsion from containers by introducing aqueous sodium sulfonate solution and an alkaline agent. No. 2,442,100. Jere C. Showalter (to Standard Oil Development Co.).

Process for improving the corrosion resistance of an alloy containing chromium, the remainder being principally metal of the group iron and nickel which comprises heating the alloy in a moist hydrogen atmosphere at a temperature high enough to produce a coating of Cr_2O_3. No. 2,442,223. Herbert H. Uhlig (to General Electric Co.).

Removing dissolved impurities selected from the class consisting of silica and fluorides from aqueous liquids comprising adding a double hydrated dolomitic lime and separating the liquid from solid matter mixed. No. 2,442,584. Carvin Calmon (to The Permutit Co.).

Inhibiting the formation of foam in an aqueous gas-liquid system by incorporating a predominantly hydrophobic organic substance comprising hydrophilic groups spaced by an intermediate hydrocarbon chain containing at least 6 carbon atoms, said hydrophilic groups having attached thereto hydrocarbon chains containing at least 8 carbon atoms. No. 2,442,768. Lewis O. Gunderson (to Dearborn Chemical Co.).

Production of spherical gel particles. No. 2,442,884. Glenn M. Webb and Reno W. Moehl (to Universal Oil Products Company).

Method of quenching with a first cooler fluid, a second hotter fluid flowing in a pipe which second fluid during quenching tends to precipitate solids on the inner surfaces of said pipe, and which solids are relatively slowly soluble in the first fluid. No. 2,442,898. Bernard G. Maguire (to Phillips Petroleum Co.).

Treating an aqueous solution to effect an exchange of anions comprising contacting with an anion exchange resin prepared by alkaline condensation of a free polyethylene polyamine with an aldehyde selected from the class consisting of formaldehyde, fufural and glucose and an organic compound selected from the class consisting of ketones and aldehydes. No. 2,442,989. Sidney Sussman (to The Permutit Co.).

Catalyst reactivation. No. 2,443,056. Charles Richker (to The Texas Co.).

Method and apparatus for transfer of particle form solids. No. 2,443,180. Eric V. Bergstrom (to Socony-Vacuum Oil Co.).

Treating a fatty acid mixture containing an unsaturated higher fatty acid, a relatively long carbon chain saturated higher fatty acid and a relatively short carbon chain saturated higher fatty acid to separate saturated from unsaturated acids comprising fractionally distilling. No. 2,443,184. Edwin W. Colt (to Armour & Co.).

Method of conferring accelerating setting properties on a dihydroxy benzene-aldehyde adhesive before the setting thereof and utilization of the adhesive in the bonding of materials. No. 2,443,197. Philip Hamilton Rhodes (to Koppers Co., Inc.).

Quenching of hot gases by a continuous method for bringing an organic fluid to a conversion temperature, effecting a desired conversion thereof and then recovering a substantial amount of the heat. No. 2,443,210. John D. Upham (to Phillips Petroleum Co.).

Method and apparatus for removing gel. No. 2,443,282. Thomas O. Tongue (to The Davison Chemical Corp.).

Emulsification of coal tar pitch. No. 2,443,322. John Alexander Montgomerie and Peter Kennedy Archibald and Leonard Charles Bradshaw (to International Bitumen Emulsions Limited).

Removing carbonaceous material by subjecting to the action of an atmosphere containing at least ¼% by weight ozone. No. 2,443,373. Victor N. Borsoff.

Method and apparatus for transfer of particle form solids. No. 2,443,412. Eric V. Bergstrom and Ernest Utterback (to Socony-Vacuum Oil Co., Inc.).

Process for drying spherical hydrogel catalysts. No. 2,443,462. Charles N. Kimberlin and Jerry A. Pierce (to Standard Oil Development Co.).

Canadian

Process for converting a salt of a strong acid into the corresponding salt of a weak acid by treating an aqueous solution containing a weak acid and a salt of a strong acid with an anion active resin. No. 449,227. Walter W. Durant and Cyril B. Clark (to American Cyanamid Co.).

A process of continuously dissolving a solid material in a liquid comprising spreading out the stream of liquid into a continuous film having the form of a converging conus and causing the solid material to fall on the film. No. 449,521. Frederick André Möeller (to Naamlooze, Vennootschap W. A. Scholten's Chemische Fabrieken).

Process and apparatus for executing catalytic conversions with regenerative contact masses. No. 449,537. Irving I. Schultz (to Shell Development Co.).

Process for producing a partial pyrolysis of wood which comprises externally applying heat to the wood in a retort raising the temperature of the wood to above 180° C., then passing an atmosphere containing at least 90 per cent of steam thereby continuously removing the volatile products liberated from the wood and also preventing a temperature rise above 275° C. due to exothermic reaction. No. 449,615. Alfred H. White.

Regulating or controlling the level of liquid. No. 449,971. William Thomas Marchment (to Evershed & Vignoles Ltd.).

Recovering heat and chemicals by spraying the liquor into a vertical furnace chamber in intimate contact with an ascending stream of high temperature gases. No. 450,080. Leslie S. Wilcoxson (to Babcock-Wilcox and Goldie-McCulloch Ltd.).

Measuring the specific gravity of a flowing stream of liquid. No. 450,169. John R. Martin and Forrest B. Burrell (to Standard Oil Development Co.).

Controlling reaction temperatures in reactions simultaneously conducted at different temperature levels. No. 450,337. Lev Ahron Mekler (to Universal Oil Products Co.).

Rubbers

Recovering rubber from Cryptostegia leaves by fermentation by **Clostridium roseum** until the protoplasts containing the rubber globules are released from the cellulose part of the plant. No. 2,440,554. Joseph Naghski, Jonathan W. White, Jr. and Samuel R. Hoover (to United States of America).

Preparing sponge rubber which comprises adding a lower substituted nitro alkanol to a rubber stock containing an acidic accelerator and a gas forming ingredient. No. 2,440,893. Arthur W. Campbell (to Commercial Solvents Corporation).

Producing a dispersion of carbon black in a synthetic rubbery elastomer. No. 2,441,090. Theodore A. Te Grotenhuis and Charles B. Frost (to The General Tire & Rubber Company).

Vulcanising a rubber by heating a rubber and sulfur in the presence of a condensation product of a 2-mercapto thiazole, formaldehyde and ammonia. No. 2,441,223. Marion W. Harman (to Monsanto Chemical Company).

Rubber hydrochloride film. No. 2,441,328. Harold Judson Osterhof (to Wingfoot Corporation).

Automobile tire comprising a fabric and covering synthetic, solid, plastic, hydrocarbon polymer of isobutylene with a diolefin having 4 to 6 inclusive carbon atoms together with pulverized copper. No. 2,441,945. Per K. Frolich and Irving E. Lightbown (to Jasco Inc.).

A flexible, elastic structure comprising a body of cured natural rubber; a body of cured solid elastic hydrocarbon interpolymer of isobutylene with a polyolefin having 4 to 12 carbon atoms per molecule and an interposed tie-gum layer comprising a polymer of isobutylene with a minor polyolefin having 4 to 12 carbon atoms per molecule, the said polymer having in chemical combination therein both sulfur chloride and sulfur. No. 2,442,068. Ralph F. Wolf and William J. Sparks (to Standard Oil Development Co.).

Composition comprising rubber, normally subject to deterioration by the action of molecular oxygen, containing a catalyst of their group consisting of copper, cobalt, iron and their compounds, normally effective to catalyze oxidation of said rubber, and having incorporated therein a metal deactivator in a small proportion sufficient to deactivate said catalyst, said metal deactivator having the formula

HO—R—CH=N—R'—OH

wherein each of R and R' represents an ortho arylene radical. No. 2,442,200. Frederick B. Downing and Charles J. Pedersen (to E. I. du Pont de Nemours & Co., Inc.).

Stabilized alkaline aqueous rubber dispersion which comprises an alkaline aqueous rubber dispersion containing zinc oxide and a condensation product of ethylene oxide and a glycol having at least four ethenoxy groups. No. 2,442,341. Malcolm R. Buffington.

Compounding synthetic rubber with sulfur containing mineral oil extract. No. 2,442,781. Fritz S. Rostler (to Wilmington Chemical Corp.).

Canadian

Rubber-like polymeric material obtained by polymerizing a mixture of 2-chlorobutadiene-1,3 and a N-substituted maleic imide. No. 449,254. George Lowrance Dorough (to Canadian Industries, Ltd.).

A rubber-like synthetic product made by polymerizing a mixture of vinylidene halide with a diene in an aqueous dispersion in the presence of an alkali metal hydroxide. No. 449,257. Mortimer Alexander Youker (to Canadian Industries, Ltd.).

Synthetic rubber-like material obtained by polymerizing 2-chloro-1,3-butadiene in the presence of an ester of an aliphatic unsaturated carboxylic acid. No. 449,262. Frank Willard Johnson (to Canadian Industries, Ltd.).

Process for the copolymerization of a natural rubber with a polymerizable monoethylenically unsaturated compound. No. 449,265. Ralph Albert Jacobson (to Canadian Industries, Ltd.).

Cellular, rubbery, tough and resilient product of evenly pored structure from plasticized vinyl chloride/furmaric ester copolymer. No. 449,275. George Lowrance Dorough and Henry John Richter (to Canadian Industries, Ltd.).

Obtaining elastic synthetic linear polyamide articles by heating the polyamide article in its undrawn state with an alcohol formaldehyde and a solution of acid catalyst. No. 449,276. John Richard Lewis and David McCreath (to Canadian Industries, Ltd.).

Synthetic rubber-like material being a copolymer of a fluorobutadiene and styrene. No. 449,277. Leroy Frank Salisbury (to Canadian Industries, Ltd.).

Improving the processing characteristics of butadiene-styrene interpolymers which comprises incorporating o-sulphobenzoic anhydride. No. 449,810. John Richard Vincent (to Canadian Industries, Ltd.).

Synthetic rubber-like butadiene - acrylonitrile - aliphatic vinyl-ethanyl carbinol material. No. 449,809. Charles Joseph Mighton (to Canadian Industries, Ltd.).

Method of bonding a rubber to a magnesium metal by applying a mixture of concentrated sulphuric acid and ethylene glycol. No. 449,832. John Richard Rafter (to The Firestone Tire & Rubber Co.).

Production of interpolymerization products of a conjugated butadiene and isobutylene in the presence of a polymerization catalyst capable of setting free oxygen in emulsion. No. 449,845. Heinrich Hopff and Curt W. Rautenstrauch (to Jasco, Inc.).

Emulsion polymerizates of butadienes by using water soluble salts of olefin sulphonic acids as the emulsifying agent. No. 450,033. George E. Serniuk (to Standard Oil Devel. Co.).

Preservation of synthetic rubber. No. 450,283. Louis Harold Howland and Byron Alexander Hunter (to Dominion Rubber Co., Ltd.).

Preservation of synthetic rubber. No. 450,284. Robert Rhorer Sterrett (to Dominion Rubber Co., Ltd.).

Specialties

Reduction of foaming in an aqueous bath containing foam-inducing constituents by a hydroxy aliphatic amine. No. 2,439,797. Wayne L. Denman (to Dearborn Chemical Company).

Thermally vaporisable fumigant, comprising a thermally vaporisable pesticidal compound, ammonium nitrate and an ammonium nitrate-sensitising salt of chromic acid to render the composition capable of propagating throughout itself an exothermal reaction when initiated by local heating. No. 2,440,082. John Stocks Flanders and Elwyn Jones (to Imperial Chemical Industries Limited).

Liquid solvent for degreasing iron and aluminum consisting of

trichlorethylene and 0.02 to 1% by weight of an inhibitor for condensation reactions of trichlorethylene said inhibitor being a thiophene, selected from the group consisting of thiophene, 2-methyl thiophene and 3-methyl thiophene. No. 2,440,-100. Walter Klabunde (to E. I. du Pont de Nemours & Company).

Refined mineral oil, normally subject to oxidative decomposition and containing tetramethyldiamino diphenylmethane and a saturated alkyl succinic acid. No. 2,440,530. Wallace J. Yates (to Shell Development Company).

Non-drying hair preparation containing an alcoholic solution of a hair fixative ingredient of the class consisting of the esters of abietic acid and the hydrogenated esters of abietic acid. No. 2,440,555. Allen L. Omohundro and Emil C. Fanto (to McKesson & Robbins, Inc.).

Stabilizing an oxidizable substance by an antioxidant comprising hydrogenated deodorizer scum, which contains tocopherol. No. 2,440,606. Kenneth C. D. Hickman (to Distillation Products, Inc.).

Building material having a normally tacky bituminous surface and an anti-stick coating film comprising methyl cellulose, glycerine and the sodium salt of sulphated heptadecanol. No. 2,440,626. James Howard Young and Paul W. Jenkins (to H. H. Robertson Company).

Producing an aerosol by producing a solution of the material to be dispersed in trichlor monofluor methane in an airtight container, heating to place it under superatmospheric pressure, and releasing the pressure to vaporize the solution. No. 2,440,915. Zbislaw M. Roehr (to The Roberts Manufacturing Co.).

Marking ink which comprises white titanium pigment, casein, water, a small amount of a casein preservative, a terpinene-maleic anhydride-glycerol-fatty acid resin, a wetting agent, tributyl phosphate, sodium tartrate, acetone, and amyl acetate. No. 2,441,101. Irving C. Matthews and Glenn M. Atkins (to Eastman Kodak Company).

Fumigating soils and insect-infested areas on living plants by applying a viscous film-forming liquid composition comprising a liquid organic fumigant having polystyrene dissolved therein. No. 2,441,553. Edgar C. Britton (The Dow Chemical Co.).

Luminescent coated articles containing a proportion of a salt of 3-hydroxy-2-naphthoic acid and a metal selected from the group consisting of aluminum, barium, calcium, cadmium, beryllium, lead, zinc, magnesium, tin, bismuth, nickel and antimony. No. 2,441,559. Harry Burrell and Christy J. Vander Valk (to Heyden Chemical Corp.).

A soda soap lubricating grease comprising a sodium soap and a water dispersible cellulose ether. No. 2,441,720. Theodore G. Roehner and George W. Murray (to Socony-Vacuum Oil Co., Inc.).

Algin gel-forming composition. No. 2,441,729. Arnold B. Steiner (to Kelco Co.).

A heat-transfer medium consisting of a lower alkylene glycol containing from 2 through 5 carbon atoms per molecule and water stabilized against thermal decomposition by a substance selected from the class consisting of washed allyl oil and the autocondensate thereof. No. 2,441,794. Edgar C. Britton and Arthur R. Sexton (to The Dow Chemical Co.).

A heat-transfer medium consisting essentially of ethylene glycol and a composition produced by heating washed allyl oil with a lesser proportion of aniline. No. 2,441,795. Edgar C. Britton and Arthur R. Sexton (to The Dow Chemical Co.).

Liquid composition for curing freshly placed concrete comprising from 28 to 46 parts of a material selected from the class consisting of coumaroneindene resin, terpene resin, and a methylated indenemethylated styrene resin. No. 2,441,826. Ralph E. Madison (to Truscon Laboratories, Inc.).

A Uricury wax emulsion of the oil-in-water type of a mixture of Uricury wax and petroleum hydrocarbon material, and a water-soluble emulsifying agent. No. 2,441,842. Leon M. Prince, Jr.

A heat-transfer medium consisting of a lower alkylene glycol containing from two through five carbon atoms per molecule and water stabilized against thermal decomposition by a polymethylpyridine. No. 2,441,848. Arthur R. Sexton (to The Dow Chemical Co.).

A heat-transfer medium consisting of a lower alkylene glycol containing from 2 through 5 carbon atoms per molecule and not water stabilized against thermal decomposition by benzopyridines and monomethylbenzopyridines. No. 2,441,849. Arthur R. Sexton and Francis N. Alquist (to The Dow Chemical Co).

In a primary cell having an anode and a cathode, **an electrolyte** between said anode and cathode in the form of an emulsion comprising a non-conductive water-immiscible liquid, an emulsifying agent and an aqueous solution of an electrolyte compound. No. 2,441,896. Thomas G. Moir (to Burgess Battery Co.).

Waterproof protein-resin adhesive by stirring an aqueous alkaline solution of an alkali catalyzed phenolic-formaldehyde resin with soybean protein. No. 2,441,946. Russell H. Hieronymus (to The Drackett Co.).

Cleaning and polishing composition which comprises water, a hydrocarbon solvent dispersed in the water, and an abrasive powder dispersed in the water, and small amounts, sufficient to inhibit corrosion, of a water-insoluble higher aliphatic amine salt of 2-ethyl-hexyl, 3-methyl-butyl ortho-phosphoric acid and a water-soluble salt of 2-ethyl-hexyl, 3-methyl-butyl ortho-phosphoric acid. No. 2,442,024. Herschel G. Smith, Mark L. Hill and Troy L. Cantrell (to Gulf Oil Corp.).

Adhesive composition comprising in admixture in organic solvent medium, a copolymer of a major proportion of isobutylene and a minor proportion of a diolefine copolymerizable therewith, a quinone-oximino compound, and N-chlorobenzamide. No. 2,442,083. Frederick M. Hall and Richard W. Griffith (to United States Rubber Co.).

Extreme pressure agent comprising a halogenated petroleum hydrocarbon containing active halogen and sulfur also containing a small amount of a stabilizer consisting of a low molecular weight aromatic compound containing a single monocyclic aromatic hydrocarbon group of the formula C_6H_x, the residue of the molecule being composed of atoms selected only from carbon, hydrogen, and oxygen. No. 2,442,-134. Eugene Lieber and Aloysius F. Cashman (to Standard Oil Development Co.).

Producing a heat-insulating material from asbestos fibers, finely pulverized quenched blast-furnace slag, diatomaceous earth, lime, and an alkali. No. 2,442,519. Clyde C. Schuetz (to U. S. Gypsum Co.).

Rust-preventive composition comprising a liquid hydrocarbon having a minor proportion of a salt formed by an oil-soluble alkyl acid ester of phosphoric acid containing an alkyl group of about eight to about eighteen carbon atoms with the ring nitrogen of an oxazoline compound in which at least one of the ring carbon atoms carries a long chain alkyl group. No. 2,442,581. John W. Bishop (to Tide Water Associated Oil).

Insecticidal composition containing 2,2-bis (p-chlorophenol) -1,1,1-trichloroethane and an alkenyl naphthyl ether having 3 to 4 carbon atoms in the alkenyl radical. No. 2,442,652. Theodore W. Kerr, Jr. and Walter D. Harris (to U. S. Rubber Co.).

Insecticidal composition containing 2,2-bis (p-chlorophenol)-1,1,1-trichloroethane and material selected from the group consisting of alkyl naphthyl ethers having 2 to 5 carbon atoms in the alkyl radical. No. 2,442,653. Theodore W. Kerr, Jr. and Walter D. Harris (to U. S. Rubber Co.).

Rust-preventive lubricating oil containing a hydrogenated and hydrolyzed product of the reaction of an olefin with maleic acid anhydride and an alkyl phenol oxidation inhibitor. No. 2,442,672. George Hugo von Fuchs and Norman B. Wilson (to Shell Development Co.).

Damping fluid comprising tri octyl phosphate and a commercial mixture of the polymerized octyldecyl esters of methacrylic acid. No. 2,442,741. John D. Morgan and Russell E. Lowe (to Cities Service Oil Co.).

Insecticidal composition including as active toxicants a 1.1-di-(chlorophenyl)-2.2.2-trichloroethane and monocyclohexyl-diphenylether. No. 2,442,760. Curtis E. Dieter and Bernard J. Thiegs (to Dow Chemical Co.).

Block grease which comprises a soda lime base block grease, and the alkali saponification products of a wax selected from the group consisting of carnuba wax and ouricury wax, and of excess alkali in the form of a sodium carbonate. No. 2,-442,828. Hershel G. Smith, Mark L. Hill and Carl Malcolm Peck (to Gulf Oil Corp.).

Aqueous dispersion for application to fibrous material that is electropositive when in contact with water, the dispersion including dispersed particles of wax, a fatty acid monoamide of an alkylene diamine, an acid neutralizing a portion at least of the amino group of the said monoamide of a diamine, and a fatty acid amide of a hydroxyalkyl amine, the particles including the wax being electropositive. No. 2,442,972. Sidney M. Edelstein.

Grease composition stabilized against texture change, comprising a homogenous mixture of a mineral oil, sufficient metallic soap to thicken the mineral oil to a gel and 0.05-5.0% by weight of tetra methyl diamino diphenyl methane. No. 2,443,-026. James G. Detwiler (to The Texas Co.).

Fuel composition consisting of about 0 to 15% most readily inflammable liquid hydrocarbons of a flash point not higher than about 150° F., 0 to 20% readily inflammable liquid hydrocarbons of a flash point from 150° F. up to about 260° F., a substantial amount up to about 20% paraffin as readily inflammable hydrocarbon of a flash point from 260° F. up to about 300° F., 0 to 20% least readily inflammable liquid hydrocarbons of a flash point from 300° F. up to about 600° F., 1 to 30% pitch, and 1 to 12% starch, 3 to 65% by weight finely divided coal and 3 to 60% of charcoal. No. 2,443,029. Fred Elkan.

Adhesive cement having a modulus of elasticity of the order of that of cellular glass, comprising Portland cement, asphalt, dolomitic limestone, sodium silicate, liquid, and of Type Na_2O, $2SiO_2$ and water. No. 2,443,081. George M. Rapp (to John B. Pierce Foundation).

Thixotropic water dispersible paint remover comprising a protein colloid in a paint remover solvent, a stabilizer comprising a reaction product of a base chosen from the group composed of the alkali metal hydroxides, ammonium hydroxide with an organic acid taken from the group of the soap forming saturated fatty acids, soap forming unsaturated fatty acids, resin acids. No. 2,443,173. Nathaniel L. Baum and Jean Wynkoop (to Turco Products Inc.).

Compound for treating produce which consists in mixing sulfur 1 lb., calcium oxide 4 lbs., and magnesium sulfate 1 lb., and heating such mixture. No. 2,443,224. Benjamin R. Burgess and Millies M. Burgess.

Hydrocarbon gel which comprises dissolving in a liquid hydrocarbon a hydrocarbon-soluble alkyl methacrylate-methacrylic acid interpolymer. No. 2,443,378. Harry R. Dittmar and Daniel E. Strain (to E. I. du Pont de Nemours & Co.).

Flame resistant composition comprising polyvinyl acetate, plasticizer, and antimony trioxide filler. No. 2,443,566. Robert Loveland (to Johnson & Johnson).

Deterioration inhibitors for a hydrocarbon motor fuel. No. 2,-443.569. Albert C. Ruggles (to Eastman Kodak Co.).

Mineral oil composition comprising a mineral oil fraction and a miror proportion of a mixture of neutral and partial esters of a hydroxy-substituted aliphatic dicarboxylic acid. No. 2,-443,578. Everett W. Fuller and Ralph V. White and Bertrand W. Story (to Socony-Vacuum Oil Co.).

Mineral oil composition comprising a mineral oil fraction with a mixture of neutral and partial esters of malic acid and oleyl alcohol. No. 2,443,579. Everett W. Fuller and Ralph V. White and Bertrand W. Story (to Socony-Vacuum Oil Co.).

Steam cylinder lubricant consisting of a mineral oil fraction. No. 2,443,585. Leon Salz and Samuel P. Marley (to Socony-Vacuum Oil Co.).

Canadian

Textile oil comprising a base oil with a scouring assistant a mixed diester of polyhydric alcohol of at least three hydroxy groups with a long chain fatty acid of at least 10 carbon atoms and not more than two double bonds and a short chain aliphatic acid of less than 6 carbon atoms. No. 449,179. Alfred C. Goodings, Harry B. Marshall and Herbert W. Lemon.

Electrically semi-conducting composition comprising finely divided anthracite coal of colloidal dimensions embodied in a polymerized phenyl ethyl silicone. No. 449,303. Harry H. Barker and Lawrence R. Hill (to Canadian Westinghouse Co.).

As a soldering flux a resin derived by partially reacting an organic diabasic acid and a polyhydric alcohol. No. 449,307. Lawrence R. Hill (to Canadian Westinghouse Co., Ltd.).

Bread improver comprising sodium chlorite, ammonium sulfate, sodium chloride, calcium sulfate and starch. No. 449,372. Willis S. Hutchinson and Richard I. Derby (to the Mathieson Alkali Works).

Adhesive composition suitable for forming substantially moisture vapour-proof laminates comprising petrolatum and compatible hard and brittle water insoluble metallic resinate. No. 449,390. Lothian M. Burgess and Gene Abson (to H. P. Smith Paper Co.).

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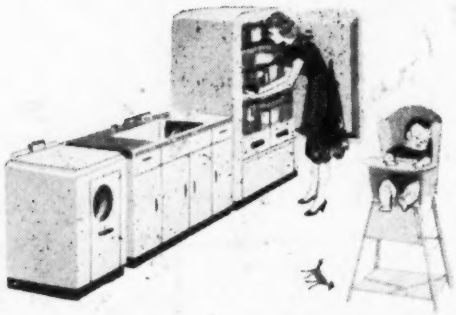

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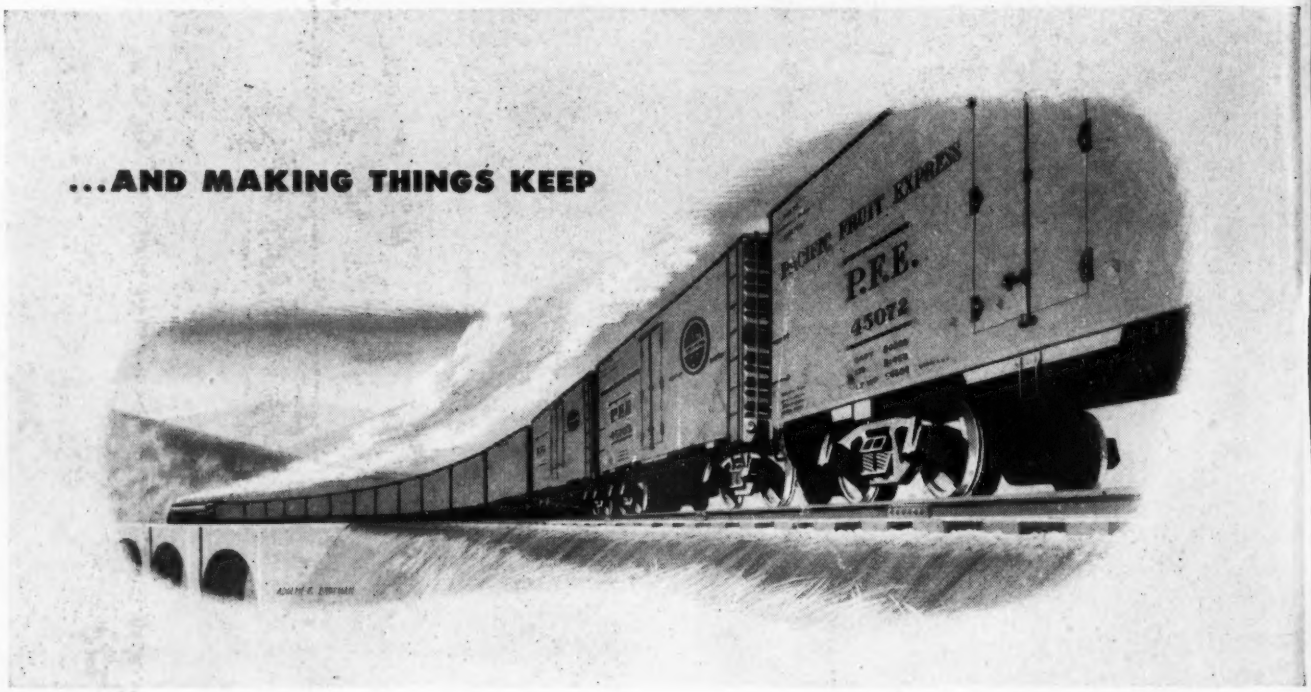

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